# CONCRETE HANDBOOK

POPULAR MECHANICS PRESS

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# CONCRETE *Handbook*

Everything you need to know to make use of this universal building material

## RECOMMENDED MIXTURES FOR SEVERAL CLASSES OF CONSTRUCTION
### Intended primarily for use on small jobs

| Kind of Work | U.S. gallons of water to add to each 1-sack batch | | | Trial mixture for first batch | | | Maximum aggregate size |
|---|---|---|---|---|---|---|---|
| | Damp sand and pebbles | Wet sand and pebbles | Very wet sand and pebbles | Cement | Sand | Pebbles | |
| Foundation walls which need not be watertight, mass concrete for footings, retaining walls, garden walls, etc. | 6¼ | Average sand 5½ | 4¾ | sacks 1 | cu.ft. 2¾ | cu.ft. 4 | in. 1½ |
| Watertight basement walls, walls above ground, lawn rollers, hotbeds, cold frames, etc. Well curbs and platforms, cisterns, septic tanks, watertight floors, sidewalks, steppingstone and flagstone walks, driveways, play courts, outdoor fireplace base and walls, refuse burners, ash receptacles, porch floors, basement floors, garden and lawn pools, steps, corner posts, gate posts, piers, columns, etc. | 5½ | Average sand 5 | 4¼ | 1 | 2¼ | 3 | 1½ |
| Fence posts, grape arbor posts, mailbox posts, etc., flower boxes and pots, benches, bird baths, sun dials, pedestals and other garden furniture, work of very thin sections. | 4½ | Average sand 4 | 3¾ | 1 | 1¾ | 2 | ¾ |

## SUGGESTED CONCRETE MIXES FOR FARM CONSTRUCTION *

| Use of concrete | U. S. gal. of water per sack cement with average moist sand | Sand and gravel per sack cement | | Largest size of gravel |
|---|---|---|---|---|
| | | Sand cu.ft. | Gravel cu.ft. | |
| Most farm construction such as floors, steps, basement walls, walks, yard pavements, silos, grain bins, water tanks, etc. | 5 | 2¼ | 3 | 1½ in. |
| Concrete in thick sections and not subject to freezing. Thick footings, thick foundations, retaining walls, engine bases. | 5½ | 2¾ | 4 | 1½ in. |
| Thin reinforced concrete such as milk cooling tanks, fence posts, thin floors, most uses where concrete is 2 in. to 4 in. thick. | 5 | 2¼ | 2½ | ¾ in. |
| Very thin concrete such as top course of 2-course floors and pavements, concrete lawn furniture, most uses where concrete is 1 in. to 2 in. thick. | 4 | 1¾ | 2¼ | ⅜ in. |

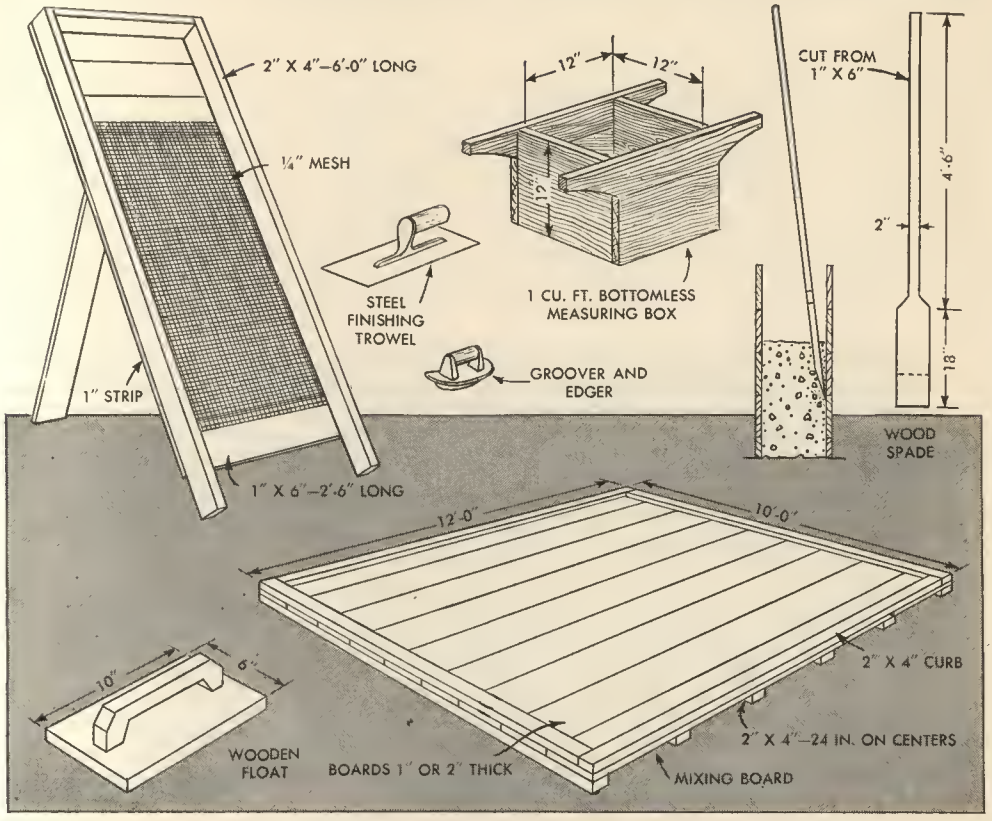
* These ore trial mixes for overoge conditions. It is porticulorly important to use not more water per sack of cement than shown in the toble. If sond is very wet decrease omount of water used 1 gal. per sock of cement. If sond is dust dry increose amount of woter ½ gol. per sock of cement. Change proportions of sond ond gravel slightly if necessary to get a workable mix

## QUANTITIES OF CEMENT, FINE AGGREGATE AND COARSE AGGREGATE REQUIRED FOR 1 CU. YD. OF COMPACT MORTAR OR CONCRETE

| MIXTURES | | | QUANTITIES OF MATERIALS | | | | |
|---|---|---|---|---|---|---|---|
| Cement | Fine Aggregate (sand) | Coarse Aggregate (gravel or stone) | Cement in sacks | Fine Aggregate | | Coarse Aggregate | |
| | | | | cu.ft. | cu.yd. | cu.ft. | cu.yd. |
| 1 | 2 | ... | 12 | 24 | 0.9 | .. | .... |
| 1 | 3 | ... | 9 | 27 | 1.0 | .. | .... |
| 1 | 1 | 1¾ | 10 | 10 | 0.37 | 17 | 0.63 |
| 1 | 1¾ | 2 | 8 | 14 | 0.52 | 16 | 0.59 |
| 1 | 2¼ | 3 | 6¼ | 14 | 0.52 | 19 | 0.70 |
| 1 | 2¾ | 4 | 5 | 14 | 0.52 | 20 | 0.74 |

1 sack cement = 1 cu.ft.; 4 sacks = 1 bbl.

# Mixing, Finishing, Curing Concrete




**Some of the tools and equipment needed for small concrete jobs**

UNTIL the recent discovery that the strength, durability and water-tightness of concrete are dependent upon the proportion of water to cement it was customary to specify mixtures as one part cement to a certain number of parts of sand and pebbles. Modern practice is to state the amount of mixing water for each sack of cement, varying according to the class of work.

In a concrete mix, cement and water form a paste which, upon hardening, acts as a binder cementing the particles of sand and pebbles together into a permanent mass. The use of too much mixing water thins or dilutes the paste, weakening its cementing qualities. It is important that cement and water be used in proper proportions to get the best results.

The table on page 2 gives recommended quantities of water for different classes of work and also suggests proportions of cement to sand and pebbles to use in trial batches. The trial batch for sidewalks is 1 part cement to 2 parts sand and 3 parts pebbles (1:2:3 mix). It may be necessary to change the amounts of sand and pebbles as will be described to obtain a smooth, plastic workable mix. Under no conditions vary the amount of water from the quantity shown.

The trial proportion (1:2:3) suggested for sidewalks may result in a mixture that is too stiff, too wet or which lacks smoothness and workability. This is remedied by changing slightly the proportions of sand and pebbles, not the water. If the mix is too wet, add sand and pebbles slowly until the right degree of wetness is obtained. If the mix is too stiff cut down the amounts of sand and pebbles in the next batch. In this way the best proportions for any job may be determined.

A workable mixture is one of such wetness and plasticity that it can be placed in the forms readily, and that with spading

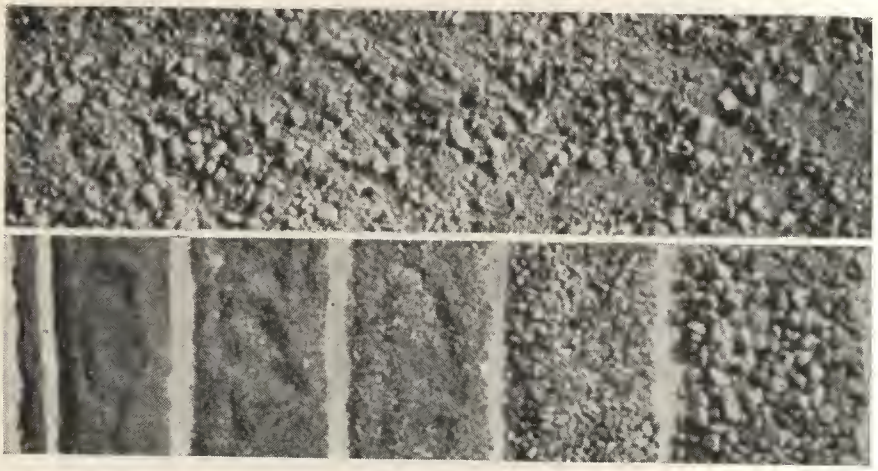
and tamping will result in a dense concrete. There should be enough cement-sand mortar to give good smooth surfaces free from rough spots, and to bind pieces of coarse aggregate into the mass so they will not separate out in handling. In other words the cement-sand mortar should completely fill the spaces between the pebbles and insure a smooth plastic mix. Mixtures lacking sufficient mortar will be hard to work and difficult to finish. Too much sand increases porosity and cuts down amount of concrete obtainable from a sack of cement.

A workable mix for one type of work may be too stiff for another. Concrete that is to be deposited in thin sections like fence posts must be more plastic than for more massive construction such as walls. A good rule to follow is to proportion the sand and pebbles to obtain the greatest volume of concrete of correct plasticity for the work to be done.

Sand and pebbles or crushed rock are usually spoken of as "aggregate." Sand is called "fine aggregate" and pebbles or crushed stone "coarse aggregate." Fine aggregate such as rock screenings includes all particles from very fine (exclusive of dust) up to those which will pass through a screen having meshes ¼ in. square. Coarse aggregate includes all pebbles or broken stone ranging from ¼ in. up to 1½ or 2 in. In thin walls of slabs the largest pieces of aggregate should never exceed one-third the thickness of the thinnest section. Maximum sizes of aggregate for different classes of work are shown in the table.

Sand should be clean and hard, free from fine dust, loam and clay and vegetable matter. These foreign materials prevent bond between the cement and sand thereby reducing the strength of the concrete. Concrete made with dirty sand hardens very slowly and often will not harden sufficiently to be used for its intended purpose.

Sand should be well graded, the particles should be not all fine nor all coarse, but should vary in size from fine up to that which will pass through a ¼-in. mesh screen. If the sand is well graded the finer particles help to fill the spaces between the larger ones.



**Good concrete sand is shown in the upper photo, with sizes varying from very fine up to pebbles which will just pass through a sieve having 4 openings per lineal inch. The variety of sizes needed in a good concrete sand is illustrated by the six sizes which were screened out of the natural mixture of sand shown**

**Bank run gravel**—Bank or creek gravel that will answer the purpose of sand and gravel combined sometimes can be obtained, and frequently it is used in small jobs of concrete work just as it comes from the pit or creek. Although such gravel occasionally contains nearly the right proportions of sand and gravel, in the majority of sand pits and gravel banks there is a great variation in the sizes of the particles and in the relative quantity of each.

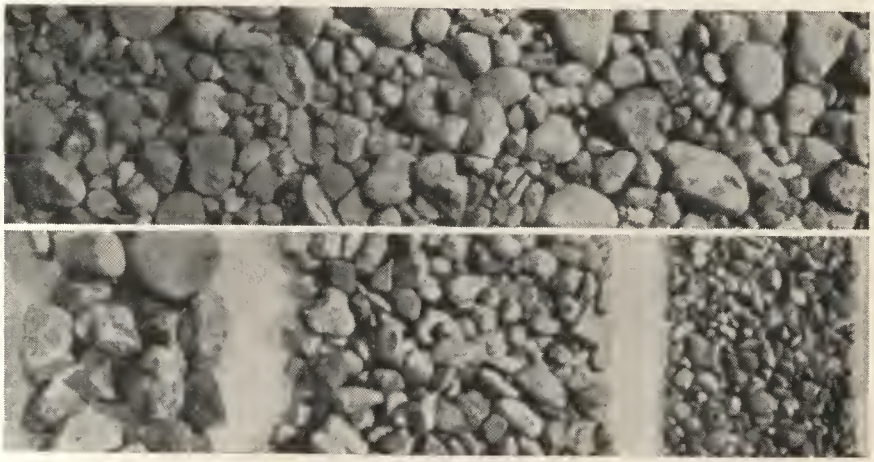
A test to determine whether bank run contains approximately the right balance of sand and gravel is made by selecting from the pit a representative sample of at least 2 cubic feet and screening it over a ¼-inch mesh screen. The part passing through the screen is considered sand, while the part retained is gravel.

In a well-graded mixture the proportions of fine and coarse aggregate should be approximately those stated on page 2. Unless the sand and gravel exist in approximately the correct proportions, they should be separated by screening and remixed in the correct proportions, as well-graded aggregates make stronger concrete, and, ordinarily, enough cement will be saved to pay for the cost of screening.

**Washing gravel**—Generally gravel cannot be washed thoroughly by pouring water over a pile unless there is only a small quantity on a platform, where it can be stirred by shoveling and the dirty water allowed to drain away freely. A large supply of water must also be available. While it is feasible to wash small quantities on a loose-bottom wagon, as generally done such washing is likely to be ineffective. A concrete mixer can sometimes be utilized for washing by putting a quantity of gravel and an abundance of water into it and revolving it several times. Generally one such washing will clean the gravel. When a considerable quantity of gravel or bank run must be washed, especially if poorly graded as to size, it may be more economical to purchase clean, well-graded material from commercial sources.

**Broken stone**—Broken stone should be clean, hard, and of a size suited to the character of the work, and the same care in grading should be exercised as in the case of gravel. Granite, hard limestone, and hard sandstone are commonly used.

Field stones are common in many localities, and it may be economical to use them after they have been crushed. Small stone crushers operated by gasoline engines of three or four horsepower may be profitable if a large amount of stone is needed. The finer particles, after the dust is removed, can be used as sand. Broken terra cotta, brick, and old concrete, if hard and strong, may be used for unimportant work where no great strength is required, as in the base course of pavements and in walls of lightweight buildings, but special care should be taken not to have the particles show on the finished surface.



**Good concrete gravel is shown in the top photo. Note the variety of sizes, the smaller stones filling in the spaces between the larger ones. The three samples in the lower photos were obtained by screening natural mixture of gravel shown above. Smallest sizes are ¼ to ⅜ in.; next are ⅜ to ¾ in.; largest ¾ to 1½ in.**

**Lightweight aggregates** — The ordinary weight of concrete is about 145 pounds per cubic foot. Lighter weight concrete suitable for certain purposes may be made by using aggregates of light weight. For years cinders have been used and burnt clay manufactured by a special process also has come into use, with which a concrete weighing from 100 to 120 pounds can be made. Processed water-cooled blast-furnace slag also is available.

If cinders are to be used in concrete, they should be composed of hard, clean, vitreous clinkers free from sulphides, soot, and unburned coal or ashes. As a precaution against the presence of small amounts of detrimental substances, cinders should be soaked thoroughly in water 24 hours before being used. If clean, they will not discolor the hands when a small quantity is rubbed between the palms. Ashes from cook stoves and similar domestic heaters

are not at all suitable for aggregate and must not be confused with cinders.

If the mixtures recommended in the job produce a concrete that is too stiff, too sloppy, or too harsh, the quantity of sand and gravel should be reduced or increased so as to secure the proper degree of wetness for the kind of work being done. Under no circumstances should the quantity of water specified per sack of cement be changed.

Although machine mixing is preferred, first-class concrete can be mixed by hand. Whichever way is used, mixing should continue until every pebble is completely coated with a thoroughly mixed mortar of cement and sand.

If a tight floor is not available for mixing concrete a watertight mixing platform should be made. It should be large enough for two men using shovels to work upon at one time. This platform is preferably

**MATERIALS REQUIRED FOR 100 SQ.FT. OF SURFACE FOR VARYING THICKNESSES OF CONCRETE OR MORTAR**

Quantities may vary 10 per cent either way, depending upon character of aggregate used. No allowance made in table for waste.

| Thickness of mortar or concrete (in.) | Amount of mortar or concrete (cu.yd.) | PROPORTIONS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1:2 | | | 1:3 | | | 1:1:1¾ | | |
| | | Cement (sacks) | Fine Aggregate (cu.ft.) | Coarse Aggregate (cu.ft.) | Cement (sacks) | Fine Aggregate (cu.ft.) | Coarse Aggregate (cu.ft.) | Cement (sacks) | Fine Aggregate (cu.ft.) | Coarse Aggregate (cu.ft.) |
| ⅜ | 0.115 | 1.4 | 2.8 | .... | 1.0 | 3.0 | .... | .... | .... | .... |
| ½ | 0.15 | 1.8 | 3.6 | .... | 1.3 | 4.0 | .... | .... | .... | .... |
| ¾ | 0.23 | 2.7 | 5.4 | .... | 2.0 | 6.0 | .... | 2.3 | 2.3 | 3.9 |
| 1 | 0.31 | 3.7 | 7.4 | .... | 2.7 | 8.1 | .... | 3.1 | 3.1 | 5.3 |
| 1¼ | 0.38 | 4.5 | 9.0 | .... | 3.3 | 10.0 | .... | 3.8 | 3.8 | 6.5 |
| 1½ | 0.46 | 5.4 | 10.8 | .... | 4.0 | 12.0 | .... | 4.6 | 4.6 | 7.8 |
| 1¾ | 0.54 | 6.4 | 12.8 | .... | 4.7 | 14.1 | .... | 5.4 | 5.4 | 9.2 |
| 2 | 0.62 | 7.3 | 14.6 | .... | 5.4 | 16.2 | .... | 6.2 | 6.2 | 10.5 |
| | | 1:1¾:2 | | | 1:2¼:3 | | | 1:2¾:4 | | |
| 3 | 0.92 | 7.5 | 12.9 | 14.7 | 5.8 | 12.9 | 17.5 | 4.6 | 12.9 | 18.4 |
| 4 | 1.24 | 10.0 | 17.3 | 19.9 | 7.8 | 17.3 | 23.6 | 6.2 | 17.3 | 24.8 |
| 5 | 1.56 | .... | .... | .... | 9.8 | 21.7 | 29.6 | 7.8 | 21.8 | 31.2 |
| 6 | 1.85 | .... | .... | .... | 11.5 | 26.0 | 35.2 | 9.3 | 26.0 | 37.0 |
| 8 | 2.46 | .... | .... | .... | 15.4 | 34.4 | 46.8 | 12.3 | 34.4 | 49.3 |
| 10 | 3.08 | .... | .... | .... | 19.3 | 43.2 | 58.5 | 15.4 | 43.2 | 61.6 |
| 12 | 3.70 | .... | .... | .... | 23.1 | 51.8 | 70.4 | 18.5 | 51.8 | 74.0 |

A general guide to follow is to vary the proportion of sand according to the size of the gravel. For example, when the sand is moist, as under average conditions, use approximately equal parts of sand and gravel when the size of gravel ranges from ¼ inch to ¾ inch; use two-thirds as much sand as gravel when the gravel ranges from ¼ inch to 1 inch; and use about three-fifths as much sand as gravel when the gravel ranges from ¼ to 2 inches. If the sand is dry, use about 25 percent less.

All materials including water should be accurately measured. A pail marked on the inside at different heights to indicate quarts and gallons will be found handy for measuring water. A pail may also be used for measuring cement, sand and pebbles. In mixing one-sack batches it is not necessary to measure cement as one sack holds exactly one cubic foot. Sand and pebbles are conveniently measured in bottomless boxes made to hold one cubic foot, two cubic feet, or other volumes desired.

made of matched lumber so that the joints will be tight. Strips are nailed along three sides to prevent materials from being pushed off in mixing.

The measured quantity of sand is spread out evenly on the platform and on this the required amount of cement is evenly distributed. The cement and sand are turned with square pointed shovels to produce a mass of uniform color, free from streaks of brown and gray. Such streaks indicate that cement and sand are not thoroughly mixed. The required amount of coarse aggregate is then measured and spread in a layer on top of the cement-sand mixture.

Mixing is continued until the pebbles have been uniformly distributed throughout the mass. A depression or hollow is then formed in the middle of the pile and the correct amount of water added while the materials are turned. This mixing is continued until the cement, sand and pebbles have been thoroughly and uniformly combined.

**After concrete becomes quite stiff but is still workable, the wood float is used to compact the surface and smooth out uneven spots. No further finishing is required where an even, yet gritty, non-slip surface is desired. After concrete has hardened enough to become quite stiff the steel finishing trawel is emplayed to make a smooth, dense surface. The finishing trowel should be used sparingly since overtroweling produces surfaces which, after hardening, tend to check and dust**

The concrete should be placed in the forms within 30 minutes after mixing. It should be well tamped or spaded as it goes into the forms. This operation forces the coarse concrete back from the face, making a dense concrete with smooth surfaces.

**Finishing concrete**—Newly placed concrete is leveled off in the forms with a strikeboard or wood float, then the wood float is used to make an even surface. Further finishing is delayed until the concrete hardens enough to become quite stiff. If a gritty, nonskid floor is desired, a wood float is used to produce the final finish. If a smooth, dense surface is required, a steel trowel is employed in finishing.

Stony spots found when forms are removed may be patched by working a stiff cement mortar into them with a wood float. The mortar should be 1 part portland cement to 2½ parts sand.

**Curing**—After the concrete has been placed, care should be taken that it does not dry too quickly, and in hot weather it must be protected from the sun and from drying winds. Exposed surfaces and objects made of dry mixtures should be sprayed thoroughly with water twice or oftener each day or otherwise kept moist for a week or 10 days. Materials commonly utilized for protecting concrete while curing are canvas, burlap, boards, layers of moist sand, and straw. These should be placed as soon as practicable without marring the concrete surface and be kept continuously moist. Vertical surfaces are more difficult to protect than horizontal surfaces; forms left in place during the curing period afford good protection.

**Cold weather**—If suitable methods are used, good concrete work can be done in cold weather, but with more difficulty and at somewhat greater cost than when the weather is warm. Ordinarily it is best not to attempt to do concrete work during freezing weather; many building codes do not permit it. However, the extra cost at times may be warranted by urgent need of the structure or by the fact that the concrete work carried on in winter will not seriously interfere with regular farm operations.

**Use of heat**—Perhaps the most satisfactory method of keeping concrete from freezing is to heat the materials and to inclose or cover the completed work for a few days or until most of the water has disappeared and sufficient strength has developed. When the weather is cold but not freezing, heating the materials will be sufficient. The concrete when placed should be between 70° and 100° F. and should be maintained at about 50° for at least 5 days. If a freeze is expected the concrete work

should be protected by enclosures of wood, paper, or canvas, over which, if the surface is horizontal, may be spread a 6 or 8-inch layer of straw. Earth on top of straw affords good protection. Manure should not be used to protect fresh concrete, since the acids in it are destructive and cause unsightly stains. Splits or other openings in coverings may expose parts of the work to freezing temperatures. If the temperature drops to about 20° it will be necessary to arrange the covering so that live steam can be turned in between it and the concrete or so that heat may be supplied from stoves or salamanders.

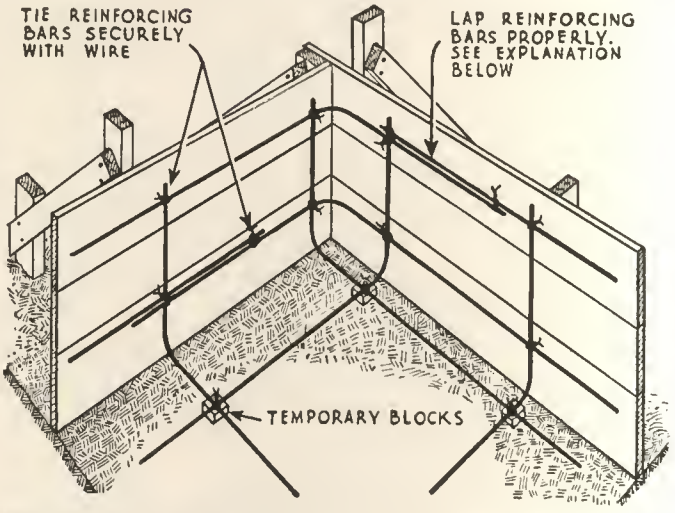
Mass work, except in very cold weather, will not require as careful protection as thin sections and, as a rule, the forms are sufficient if the exposed parts are covered.

The water can be heated sufficiently for use in concrete (not to exceed 150° F.) in kettles on stoves, in steel drums over open fires, or by steam from a boiler.

For the sand and gravel an efficient heater can be made of a metal smokestack or sheet metal bent to form an arch, placed horizontally with a fire in one end. The materials are piled over the stack, but not so high that their weight will crush the pipe. Small quantities of sand and gravel may be heated (not beyond 140° F.) on top of a metal plate with a fire under it, but the materials should be heated separately to keep them from becoming mixed. If a small boiler is available it may be economical to use steam for heating the sand and gravel. Steam is effective when forced from nozzles into the piles or circulated through perforated pipes placed under the material. If the piles are covered with canvas or other material they will retain much of the heat.

**Reinforced concrete** — Concrete is strong in compression but has little resistance to forces tending to pull it apart; therefore steel is used to reinforce those sections subjected to stretching. Barbed wire, old fencing, and scrap or rusty iron are not suitable for reinforcement. Loose rust should be cleaned off the rods, and they should be free of oil and grease. In general, all reinforcement should be protected by a covering of at least three-fourths inch of concrete, and care must be taken to place the concrete under and around the steel to secure a good bond.

**Anchor wires tightened quickly**—Anchor wires placed through concrete forms to hold them from spreading may be tightened with a carpenter's brace in which a hook is inserted. The hook is easily made from a short length of iron rod, which can be held securely in chucks of most braces.

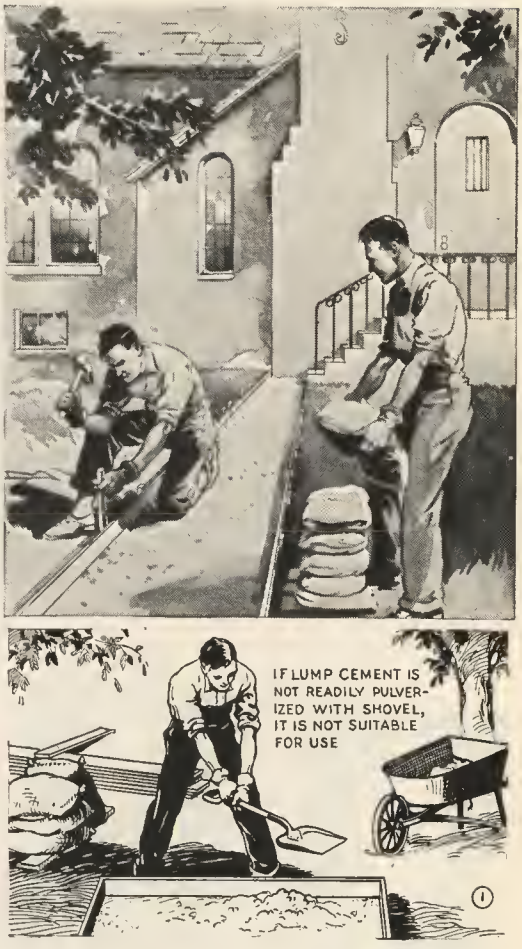



**Reinforcing bars should be placed as shown. At laps bar ends should extend past each other. Reinforcement is supported on blocks to obtain proper depth of concrete under the bars, then blocks are removed as concreting progresses**

# Good, Durable Concrete Assured by Tests

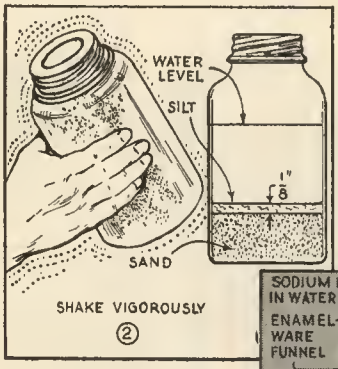
STRONG, durable concrete requires first of all that the aggregate be of good quality. Without this, even the most careful proportioning, mixing, and curing of the concrete will not produce a good job. Therefore, practical tests for the cement and aggregate are an important help to the contractor or workman who must lay concrete.

Methods of testing Portland cement are generally too complicated to be made with simple apparatus. Generally, cement made by a reliable manufacturer and properly stored can be assumed to be satisfactory. However, cement that has been stored in a damp place is useless if it has absorbed enough moisture to damage it. Cement that contains lumps that cannot be pulverized readily by striking with a shovel, Fig. 1, is unfit for use. Any water suitable to drink is satisfactory for mixing concrete. It must be clean and free from oil, acid, alkali or strong mineral content.

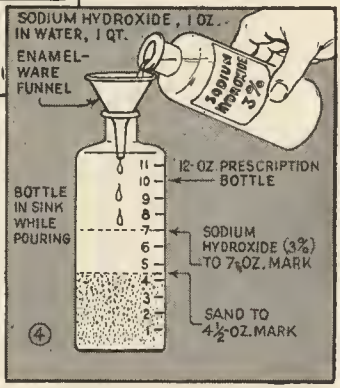



Sand and the coarse aggregate should be sound, hard and durable. Soft or flaky materials impair the strength of the concrete. Clean, sharp sand for the fine aggregates, and clean gravel or crushed rock make the best materials. An important requirement for sand is that its content of silt, loam and similar materials be low. This can be determined by a "silt test," Fig. 2. Sand sometimes contains injurious vegetable matter, which can be detected by means of a color-reaction test. To make this test, fill a 12-oz. prescription bottle to the 4½-oz. mark with the sand, and add enough of a 3% caustic-soda solution to reach to the 7-oz. mark, Fig. 4. The caustic-soda solution is made by dissolving sodium hydroxide, 1 oz., in water, 1 qt., preferably distilled water. It should be kept in a bottle with a tight rubber stopper, and care must be taken not to spill the solution on clothes, skin, or other articles, as it is very injurious to animal and vegetable matter. After adding the soda solution to the sand, the jar is closed with a rubber stopper and shaken, then set aside and allowed to settle for 24 hrs. The color of the liquid layer at the end of that time indicates the amount of vegetable matter in the sand, as shown in Fig. 5.

To obtain strong concrete, it is necessary to control accurately the quantity of water added. The table in Fig. 6 gives recommended total quantities of water that should be mixed with the cement and aggregates for various purposes. From this total quantity of water, the amount of water carried by the sand must be deducted if maximum strength is to be obtained. A rough method of determining the moisture content of sand is shown in Fig. 3. Most sand would be classified as wet. The quantity of water to add to the batch is figured easily. For example, suppose a 1:2:3 mixture is to be made (1 sack of cement, 2 cu. ft. of sand, 3 cu. ft. of crushed rock) with 6 gals. of mixing water per sack of cement. Suppose the sand is wet—feels moist to the touch and leaves the hands moist after

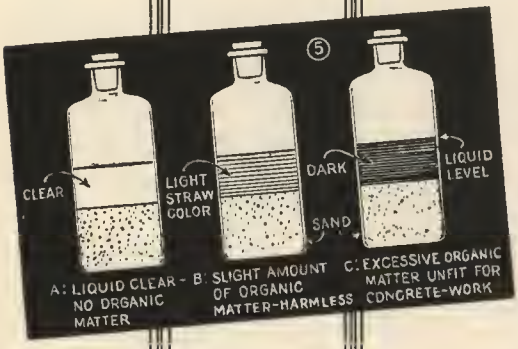



**A "silt test" to determine the purity of sand is made by filling a quart jar with sand to a depth of 2 in. and water ¾ full. Then the jar is shaken vigorously. If, after settling, silt layer on top of the sand exceeds ⅛ in. the sand is unsuitable**


**You can detect the presence of vegetable matter in sand by a color test as in Fig. 4, by pouring sodium hydroxide over the sand. After the mixture has set for 24 hrs. the amount of vegetable matter present is shown by the color as in Fig. 5**

handling it. Fig. 4 indicates that such sand contains about ½ gal. of water per cubic foot. Since one sack of cement requires 2 cu. ft. of sand, the sand will carry a total of 1 gal. of water. This must be deducted from the total water (6 gals.), leaving 5 gals. of water which must be added. Another method is to weigh exactly 2 lbs. of the sand, then dry it in an oven or over a fire. The sand is then reweighed to find the loss of weight. Multiplying this by .4 gives the moisture content in gallons per cubic foot. For example, if the loss is 1¼ oz., the moisture content is (1¼x.4) or ½ gal. per cu. ft.

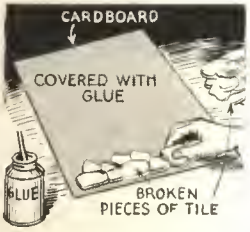



MIXING WATER RECOMMENDED FOR CONCRETE

| Kind of Work | Total gal. of water for each sack of cement * |
|---|---|
| Foundation walls | 7 gallons |
| Water-tight floors and foundations | 6 gallons |
| Driveways, walks, tennis courts | 6 gallons |
| All reinforced concrete | 6 gallons |
| Tanks | 6 gallons |
| Other water-tight concrete, or concrete subject to moderate wear or frost | 6 gallons |
| Topping for wearing surface in two-course floors, pavements, walks, etc. | 5 gallons |
| First course in two-course work | 6 gallons |
| One course heavy-duty floors | 5 gallons |
| Concrete subject to weak acid or alkali solutions | 5 gallons |

* Includes mixing water and moisture content of sand ⑥

**Laying pieces of multicolored tile in concrete steps**—When you build new concrete steps they can be given a pleasing touch of novelty by laying pieces of broken colored tile in them. To do this, glue the pieces of tile upside down to a piece of stiff cardboard, arranging them as desired and laying them as close together as possible. After the concrete has been poured let it settle for a few hours and press the assembled pieces of tile into the soft concrete. The cardboard is left fully exposed so that it can be removed after concrete has hardened. The cracks between the tile are filled with a thin mixture of cement.



# Colored Concrete

**Color with pigments**—A wide range of color is obtainable with the use of mineral coloring pigments mixed with the concrete finish. A single uniform color such as red, green or brown is most widely used in floors of this type, although a border of one color and field of another as well as simple patterns involving two or more colors have been used to some extent.

Only pigments resistant to alkali should be used. Mortar colors containing a large percentage of filler are not suitable. Pure mineral pigments and factory-prepared mixtures of cement and mineral pigment are available for the purpose. Manufacturer's directions should be carefully followed. Where mixing is to be done on the job, it should be very thorough to secure uniform dispersion and full color value of the pigment.

Various methods of mixing are used. The pigment may be added to the other dry ingredients and mixed thoroughly before the water is added. A color mixer or small ball mill may be used to mix the cement and pigment to a uniform color before these are added to the aggregate and water. Another method of mixing the pigment and cement is to pass them through a ⅛-in. or finer sieve until the mixture is uniform. After all the ingredients are in the mixer, the batch should be mixed for at least 2 or 3 minutes and until it is uniform.

The color values of pigments vary with their fineness and purity. In comparing them, one should be guided by the amounts required to produce the desired color and shade. This can best be done by making test samples allowing them to dry. The accompanying table may be used as a guide to the approximate quantities of high-grade pigments required for the colors and shades indicated.

| Color desired | Commercial names of colors for use with cement | Approximate quantities required—lb. per bag of cement | |
|---|---|---|---|
| | | Light shade | Medium shade |
| Greys, blue-black and black | Germantown lampblack* | ½ | 1 |
| | or carbon black* | ½ | 1 |
| | or black oxide of manganese* | 1 | 2 |
| | or mineral black | 1 | 2 |
| Blue | Ultramarine blue | 5 | 9 |
| Brownish red to dull brick red | Red oxide of iron | 5 | 9 |
| Bright red to vermilion | Mineral turkey red | 5 | 9 |
| Red sandstone to purplish red | Indian red | 5 | 9 |
| Brown to reddish-brown | Metallic brown (oxide) | 5 | 9 |
| Buff, colonial tint and yellow | Yellow ochre or | 5 | 9 |
| | yellow oxide | 2 | 4 |
| Green | Chromium oxide or | 5 | 9 |
| | greenish blue ultramarine | 6 | |

*** Only first-quality lampblack should be used. Carbon black is light in weight and requires very thorough mixing. Black oxide or mineral black is probably most advantageous for general use. For black use 11 lb. of oxide for each bag of cement**

**Dusted-on color**—For some floors subject only to light foot traffic, a dusted-on color mixture has been used. A 1-in. wearing course as recommended for heavy-duty floors is placed, and after screeding to the proper level a dusted-on mixture is applied immediately. This mixture is made in the proportions of about 1 part of cement, 1 to 1½ parts of sand and the required amount of pigment. The sand should be well graded with at least 80 percent pass-

ing a No. 8 sieve and not more than 3 percent passing a No. 30 sieve. The mixture should be applied uniformly at the rate of not less than 125 lb. per 100 sq. ft. of floor area.

After spreading the dry material it should be floated and worked into the slab. The first floating should be discontinued as soon as the surface becomes wet. Floating should be resumed when surface moisture has disappeared. After testing with a straightedge and high and low spots are eliminated, the finish should be troweled to a smooth surface free from defects or blemishes. The concrete should then be cured as recommended for other finishes.

**Stained floor finish**—Attractively colored floors are secured with the use of certain inorganic chemicals. These are applied to the hardened floor and react with the cement to form new compounds in the concrete to produce the color. Several applications are often necessary before the desired effects are attained. A mottled or multi-tone effect is generally produced, depending somewhat on the amount of troweling done in finishing. A number of manufacturers can supply materials used.

**Painted finish**—Concrete floor finish may be painted to attain any color effect. Oil paints, rubber-base paints and synthetic resin paints are available for this purpose. It should be realized that any traffic causes a certain amount of wear and in aisles and other places where foot traffic is heavy, touching up at intervals may be necessary and an occasional complete repainting required to keep a good appearance. Painting is not advisable where there is heavy truck traffic or dragging of boxes or other objects over the floor.

Concrete should be clean and thoroughly dry when it is to be painted. The painting should not be done for several months after construction to give ample time for curing and drying. The surface should be neutralized by mopping it with a solution containing 4 lb. of zinc sulphate per gallon of water. After allowing 48 hours for this solution to react with the concrete and dry, the surface should be cleaned with water to remove all crystals. It should then be allowed to dry thoroughly before applying the paint.

Three coats of paint are recommended. The first should be very thin—about equal parts of thinner and paint give about the proper consistency. Some thinner may be used for the second coat and the third coat may be applied as it comes from the can.

**Scraper for cement floors**—Cleaning of cement floors is done easily with this sim-


ple scraper which is nothing more than a blade from an old disk harrow mounted on a suitable handle.

**"Loaded" hose removes scaffold**—When a scaffold or concrete form is to be dismantled with as little damage as possible to the boards, a length of rubber hose is


often better than a hammer. Fill the hose with shot or sand and plug the ends. The hose distributes the blow over a larger area of the work so that undue splitting of the boards is avoided.

**Ornamental garden walls add to beauty of the grounds and insure privacy**

# Home Improvements

**Durable sidewalks** — Concrete walks meet all the requirements of a good footway. They are durable, smooth without being slippery, easy to clean and are pleasing to the eye. The width to make the walk will vary with its use. Main pathways from the street to the house entrance should be rather wide; 4 to 5 ft. is a good width. Walks on the side or rear of the house are usually made from 1½ to 3 ft. wide.

The first step is to prepare the base. If the soil is well drained, the concrete can be placed directly on it, after it has been well packed down. If the soil is not well drained a 6-in. subbase of well compacted clean, coarse gravel, or clean cinders, should be provided. Just before the concrete is deposited, the ground, or cinder subbase, should be wetted down with water.

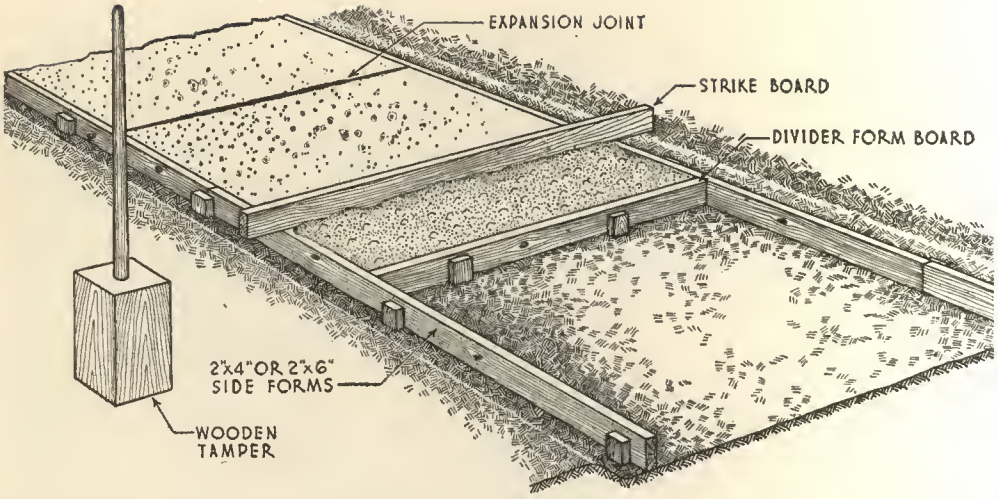
Thickness of walks varies from 4 to 6 in. If used only as a walk, 4 in. is usually thick enough, but if heavy vehicles are likely to be driven over the concrete the thickness should be 6 in.

Usually 2x4's are used for side forms, these being held in place by stakes. The top edges of the 2x4's serve as guides in leveling off the concrete. It is good practice to build walks about 2 in. above grade so that they will be well drained. In building a 4-in. walk, therefore, the area that is to be concreted will have to be excavated to a depth of 2 in. plus the thickness of the fill. The walk should be sloped toward one side for drainage; a pitch of from ¼ to ½ in. is satisfactory.

Walks are best built in 1-course construction which means that the full thickness of the concrete is placed at one time, using the same mixture throughout. To provide for expansion and contraction joints, walks should be divided at 4 to 6-ft. intervals, with partition strips placed at right angles to the side forms. Every other section is then concreted. After these have hardened enough to be self-sustaining the cross strips are removed and the remaining slabs placed.

Another method which has some advantages in that it permits the walk to be built continuously, is to place strips of tarred felt against the division or header boards. When the header boards are removed these strips, which extend entirely across the walk and for its full depth, remain permanently in position providing a definite joint between sections. Concrete is placed on both sides of the header board before it is lifted out. Then the pressure of concrete from both sides holds the tarred felt vertically, as it should be.

The concrete mixture, when of the right




**Forms and method of building 1-course sidewalk**

plasticity, is easily leveled off by a strikeboard resting on the edges of the side forms. This strikeboard is passed across the forms in a saw-like motion, thus leveling the concrete. Several hours after concrete is placed the walk is finished with a wood float to produce an even, gritty surface. To assist in curing, a covering of moist sand or earth, about 2 in. thick, is put on the concrete as soon as it has become sufficiently hard to resist marring, and is kept moist for about 7 days. The covering may then be removed and the walk put into use.

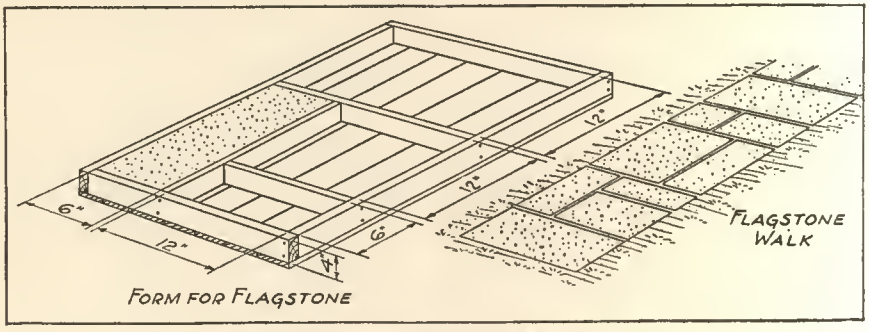
**Flagstone walks**—In the garden it is often desirable to construct a flagstone type or a stepping-stone type of walk. Simple forms for making flagstones of concrete are shown in illustration below. The various sizes of stones may be placed in any one of a number of interesting designs, one of which is shown. Since the forms will be used several times, they should be assembled so that they may be taken apart easily. Oil them well before concreting. The same mixture of concrete and method of placing and curing as described for the ordinary sidewalk may be used.

In making stepping stones, irregular holes may be dug in the ground in the position in which the stones are to lie. The concrete is then placed into these forms and smoothed off and allowed to cure as recommended.

Mineral color pigments are often introduced into the mixture to produce walks, stepping stones or flagstones of different shades, as described on page 11.

**Driveways** — An attractive concrete driveway adds much to the appearance of the grounds, and provides a year round passage to the street or highway.

The type of driveway to build is largely dependent upon how it is to be used. Where subjected to hard service, pavements covering the entire drive area give best satisfaction. Parallel strips of concrete often are satisfactory where the drive is subject




**Method of constructing forms for flagstone walk**

ed only to occasional use. However, this type of driveway should be built with curbs on the outer edges to protect the lawn.

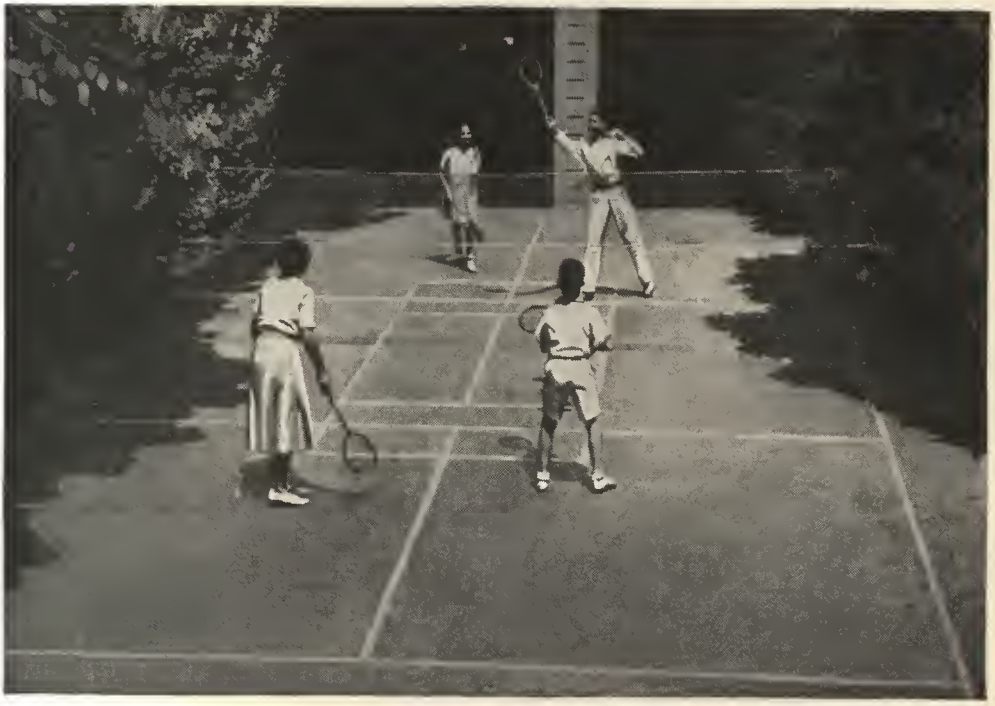
The pavement type of driveway is usually made from 8 to 10 ft. wide. A 6-in. slab is recommended in order to take care of coal and other delivery trucks. The center of the driveway should be given a crown or valley to insure drainage. The crown or valley is produced by means of a templet which shapes the surface so that the center is higher or lower than the outer edges. The base also is shaped so that the finished pavement will have a uniform thickness. The area upon which the pavement is to lie should be well packed before concreting.

Use 2x6's or 2x8's for side forms and set crosspieces at right angles every 20 or 30 ft. to provide expansion and contraction joints. The alternate section method of construction may be used or the driveway may be built continuously as described in sidewalk construction on page 9. One-course construction is recommended using the same mixture of concrete throughout. Methods of placing and curing are the same as sidewalk construction, pages 9 and 10.

Finishing is done with a wood float a few hours after placing concrete, when it is stiff but still workable. An old canvas or rubber belt, 4 to 6 in. wide and 12 ft. long will be found very useful in producing an even surface for flat or crowned pavement. The belt is drawn back and forth across the pavement, working slowly forward as the concrete is brought to desired smoothness.

**Concrete porch floors**—In building porch floors or terraces of concrete the same principles of construction apply as for sidewalk construction. If the ground upon which the porch floor or terrace is to rest is well drained the concrete may be placed directly on it; if not, a subbase from 4 to 6 in. thick of clean, coarse gravel or cinders should be provided. A well compacted subbase is essential. Where the porch floor rests on a firm fill, it will need no reinforcement, but if over an excavation or part of the basement it will need reinforcement in both directions. The recommended concrete for porch floors is given in the table on page 2. Finish with a wood float to secure a smooth, yet gritty surface and cure as recommended. Porch floors are given a slope of ¼ in. to the foot, to insure drainage.

When pouring a concrete porch, holes for railing supports can be provided by sinking bottles in wet concrete. After latter has set and railings are ready to be installed, bottles are broken out.



**Widen your driveway a little and play badminton and paddle tennis in your own back yard**

Cancrete retaining walls give the praperty a trim, neat appearance as well as protect the land fram castly and unsightly sail erasion

**Garden walls**—Ornamental walls enclosing the garden or the entire property add to the beauty of the grounds as well as give a sense of privacy. Retaining walls to hold embankments or terraces in place are also useful improvements. Concrete is the ideal construction material because of its permanence, economy and the variety of surface treatments that it permits.

Walls may be cast in place or built of concrete masonry. In either case the wall should be carried down to solid footing and in severe climates below the frost line.

If the wall is to hold an embankment in place, special construction is necessary to give it added weight and stability. Where embankments are not more than 3 ft. high this may be accomplished by filling the cores of a concrete masonry wall with a rich concrete mixture in which reinforcing rods are inserted. Where embankments exceed 3 ft. in height some provision should be made for bracing the wall with pilasters at regular intervals or for securing suitable anchorage in the earth embankment.

A 1:3 mortar (1 sack of portland cement to 3 cu. ft .of sand) to which is added 10 lb. of lime is recommended for laying up a concrete masonry wall. The mortar should be mixed thoroughly with just enough water to give plasticity and workability. Care should be taken to see that each unit is well embedded in mortar and that the joints are filled and pointed.

A surfacing of portland cement stucco may be applied to the wall if desired. Textures and colors may be chosen to harmonize with the home and surroundings. A garden wall with stucco of a well selected texture and color forms a perfect background for flowers and shrubbery.

Another popular type of masonry wall treatment is to apply a brush coat of portland cement wash to the wall so that the masonry character is retained and joint markings remain visible. When color is desired mineral pigments which are usually obtainable from local building material dealers may be incorporated in the wash coat.

Masonry units are sometimes laid up in a random fashion with varying numbers of units protruding slightly from the face of the wall, thus effecting an appearance of ruggedness. The use of more mortar

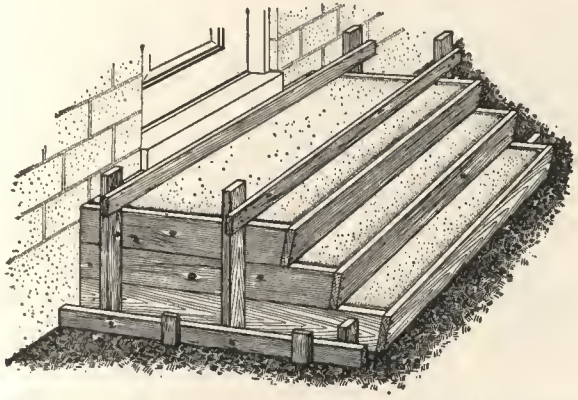
Extruded martar jaints give a rustic effect ta this cancrete masonry garden wall

than is actually necessary, commonly called protruding mortar joints, is also employed to create a rough-textured finish.

Forms for cast-in-place walls should be rigid and well braced in order to withstand the pressure of the wet concrete and produce a straight, even wall without bulges. For keeping form faces the proper distance apart, inner and outer sections should be clamped or wired together against wood spacers or spreaders. The spreaders are removed as the forms are filled with concrete. If the earth is firm the sides of the excavation will serve as forms for the wall below grade; if not, forms must be carried to the bottom of the excavation.

and they are proof against termite attack. Safest and easiest steps to climb have a tread 10 to 11 in. wide and a step height or rise of 7 to 8 in. between treads.

Forms for concrete steps may be built as shown in the accompanying diagram. Side forms are usually 1-in. boards backed-up with 2x4 form studs braced and tied as shown. Riser forms for steps not more than about 3 ft. wide may be of 1x8 boards; wider steps require 2x8 riser forms to prevent bending or bulging when the forms are filled with concrete. Where 1x8 or 2x8 riser forms are used, an actual step height or rise of about 7½ in. is obtained, resulting in steps which are easy to climb.



**Method of building forms for concrete steps. Note that riser form boards are tilted in at the bottom about 1 in. to provide additional toe space on the treads**

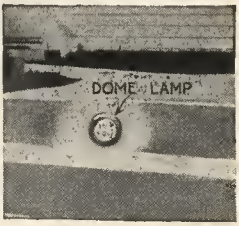
Where the retaining wall must support a considerable load, a gravity wall will be found satisfactory. It is called a gravity wall because its weight is sufficient to keep it from leaning or turning over as a result of earth pressure on one side. A wall of this type requires no steel reinforcement. The width of the base is made equal to one-half its height. The top of the wall should be at least 6 in. thick regardless of its height.

The concrete should be placed in the forms in layers of from 6 to 10 in. deep and in a continuous operation if possible to avoid construction seams. The concrete should be well spaded next to form faces so as to obtain smooth, even surfaces.

**Concrete steps**—One of the most satisfying repair or remodeling jobs is the building of safe, permanent concrete steps. Concrete steps are safe because they are not slippery in wet weather, they do not rot

If one low riser is needed to complete a set of steps the low step, for the sake of safety, should always be the bottom step. To make steps which afford maximum comfort in climbing, the riser form boards may be tilted in at the bottom about 1 in. as shown in the drawing. This provides additional toe space on the treads. Edges of steps are rounded by finishing with an edging tool after concrete has become stiff.

**Porch steps illuminated**—A dome light from the interior of a sedan-type car is just the thing to illuminate dark porch steps. Cut off the reflector so that just a rim is left to set in the concrete. Then connect it to a waterproof outlet and wire this to your porch light switch.

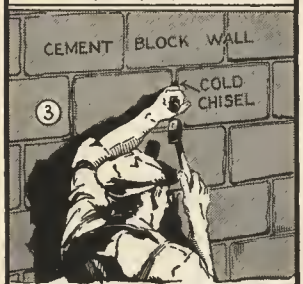


# Curing


**Where Water Enters**

- (A) WALL CRACKS
- (B) POOR JOINT BETWEEN WALL AND FLOOR
- (C) FLOOR CRACKS
- (D) FLOOR DRAINS TO SEWER


TRENCH IS DUG NEXT TO WALL FOR TILING



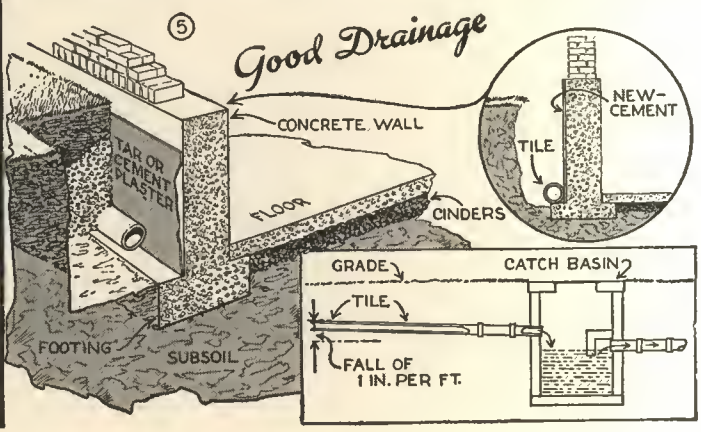

FOR BRICK, STONE OR CEMENT-BLOCK FOUNDATIONS ALL MORTAR JOINTS ARE CUT TO V-SHAPE, THEN BRUSHED WITH CEMENT


CRACKED AND POROUS CONCRETE WALLS GIVEN TWO COATS OF HOT TAR

IS YOUR basement damp, or likely to become flooded during rainy weather? Most leaky basements might have been made watertight if good construction practice had been followed when the foundation was built. A well constructed basement should be just as effective in keeping out water as a swimming pool is in keeping it in! However, much can be done to minimize water leaks and in many cases the trouble may be overcome completely. The first step is to locate, if possible, the source of the water.

**Checking the Drainage System:** Strangely enough, we must look first to the roof. Leaky eave troughs, as suggested in Fig. 1, are often the remote cause. Obstructions, such as roofing gravel or leaves, may block up the trough, causing it to rust and leak. Water then runs down the side of the building and accumulates next to the wall, where it gradually seeps through into the basement. Sometimes the soil next to the wall slopes toward it, forming a pocket, where water collects after a hard rain. Another offender is a clogged drain tile into which the downspout empties. The tile becomes clogged, causing the water to back up against the wall and seep through.

**Outside Walls:** If the drainage system is not at fault, or the building is so located that it cannot be adequately drained, provision must be made to waterproof the wall so that seepage will be prevented. Undoubtedly the best way



# LEAKY BASEMENTS

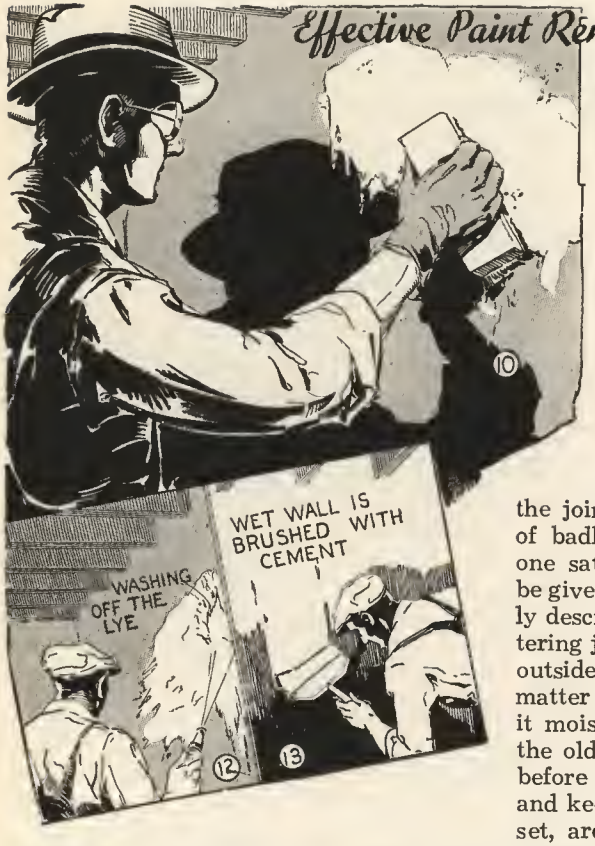

to do this is to dig a trench wide enough for a man to work in, and as deep as the foundation, along as much of the wall as is usually damp. See Figs. 2 to 5. If your wall is built of brick, stone or cement block, the mortar joints must be raked out to a depth of ½ in. and all cracks cut back in a V-shape, as in Fig. 3. The wall should then be thoroughly sprayed with a hose, after which the cracks are filled with a mortar consisting of cement, 1 part, to sand, 1½ parts, and rammed in tight with a calking tool. The reason that the walls are kept wet is to prevent the absorption of water from the new cement in the patches. If this cement dries out too quickly, it will not stick. A grout of cement and water, having the consistency of thick cream, is brushed over the entire surface next. This is followed




immediately by a coat of cement and sand mortar (1 to 2 mix), about ⅜ in. thick. The mortar should be well worked with a wood float and when hardened sufficiently, roughed with a piece of wire lath to form a good bond for another coat, which also should be ⅜ in. thick. As soon as the cement has set, the new surface should be kept wet for several days until the cement has cured. This is done to prevent "crazing" and flaking, caused by the wall absorbing the moisture out of the new material before the chemical action is over. On a wall of solid concrete, which is in fairly good condition, two coats of hot tar, as in Fig. 4, may be used instead of the cement plaster, with good results and considerably less work and expense. However, the tar is not effective over a masonry wall.

If it is possible to secure drainage, a line of drain tile should be placed at the bottom of the trench, as indicated in Fig. 5. Be sure that sufficient fall can be obtained so that the water will drain into your catch basin, septic tank or other outlet, as indicated. The trench should be backfilled with coarse gravel or crushed stone, to a depth of 18 in. and then filled up with soil. The porous material around the tile permits the surface water to drain into the tile at the loose joints.

**Inside Walls:** If it is not possible to get at the outside walls, owing to sidewalks, shrubbery, etc., the next best thing is a treatment of the walls from the inside. The

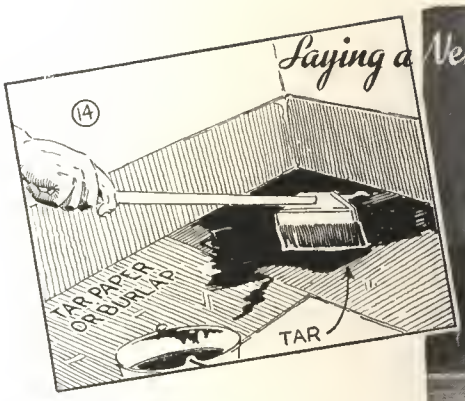



usual source of leaks is at the edge of the floor, where it joins the wall. This is caused by the fact that the walls are built first, and the floor is laid later when the concrete of the walls has thoroughly dried. The result is little or no bond between the two. The procedure in this case is to cut a groove next to the wall, to a depth of 1½ to 2 in., which is done by means of a cold chisel as in Fig. 6. The groove should be undercut as much as possible so that the seal will be anchored securely. Hot tar, or a mixture of tar and sand, is poured into this groove, as shown in Fig. 8. The tar will not adhere to wet material, and therefore it should be poured in when seepage is not occurring, if possible. Drying the groove with a blowtorch just before pouring the tar, as in Fig. 7, is also helpful to assure a good bond between the wall and floor. If the use of tar is objectionable, because of appearance, a mixture of any brand of "early strength" cement, one part to two of sand and four of gravel, may be used. It must be well rammed into the grooves to be effective. The tar has the advantage of being somewhat elastic and for this reason a tight seal will be assured.

The condition and type of your basement wall determines the method of waterproofing it from the inside. If the wall is of masonry, and the mortar is out of the joints to any extent, or if the wall is of badly cracked concrete, there is only one satisfactory remedy. The wall must be given a thorough patching, as previously described, followed by a two-coat plastering job similar to that suggested for the outside of the wall. Do not neglect the matter of "curing" the cement by keeping it moist for several days. Wetting down the old wall, painting with the grout just before plastering, roughing the first coat and keeping the surface moist after it has set, are the essential steps, all of which should be carefully followed in patching any old cement work successfully.

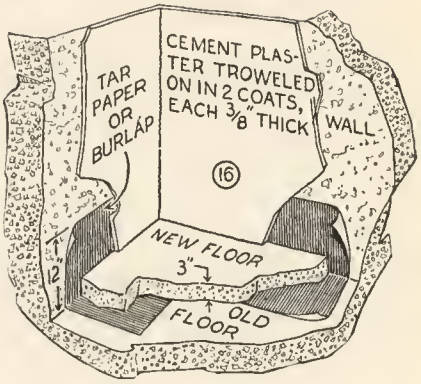
If your wall appears to be in fairly good condition, but does admit moisture, other than plain sweating, proceed as follows: Point up all mortar joints and patch up cracks with a mortar made with "quick drying" cement, 1 part, to sand, 2½ parts, as shown in Fig. 9. Allow the mortar in the patches to set for a period of 36 hrs.

Then brush the walls thoroughly with a stiff brush, to remove all loose material and dirt. If the wall has been painted, the old paint must be removed by scrubbing with a wire brush or other means as in Fig. 10. Lye mixed with a thin paste of cornstarch, in the proportions shown in Fig. 11, is effective in removing oil paint. The lye paste should be allowed to remain on the surface for 45 min., then scrubbed with a wire brush and washed off with water as in Fig. 12. Water paint, calcimine and whitewash will respond to water and scrubbing. When working with lye, be sure to wear goggles and rubber gloves.



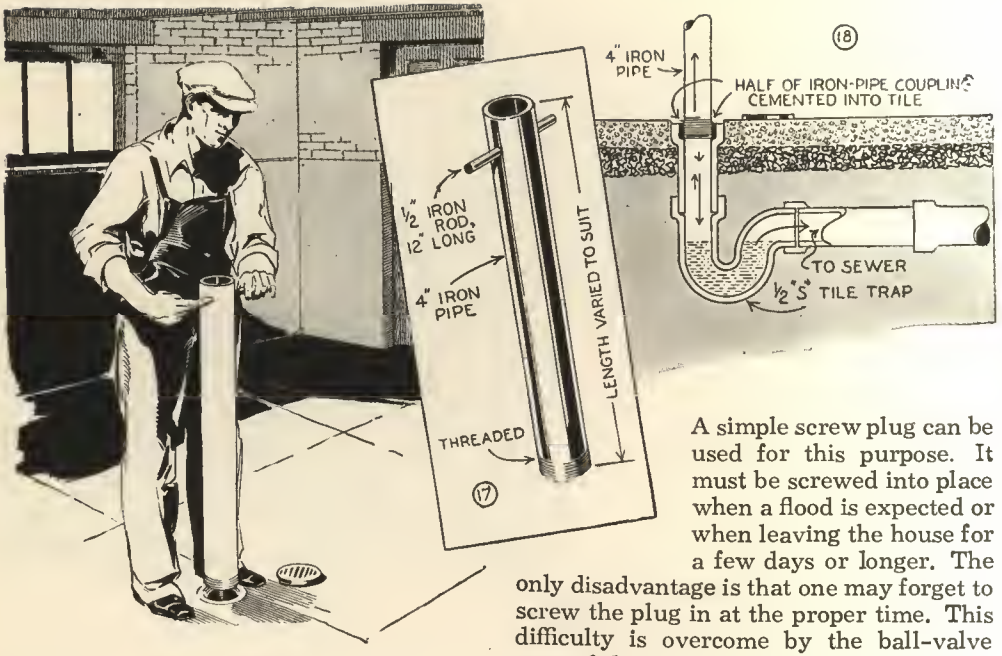


**Painting Walls:** For painting concrete walls, the powder type of cement paints containing the same ingredients as cement, and mixed with water, actually bond with a masonry or concrete wall so that they become more than a surface coating. They produce a smooth, waterproof surface that is durable. The paint can be obtained in white and several colors, or can be tinted to suit. It is available in quantities as small as 5 lbs., which will cover about 50 sq. ft., two coats. Proceed with the painting as follows: Wet the wall thoroughly with a hose, and apply a coat of the paint, which has been mixed according to the manufacturer's directions. A large paint or calcimine brush is convenient for this work, as in Fig. 13. After 6 and not longer than 24 hrs., apply a second coat of the same paint, but mixed somewhat thicker than the first. The wall should not be moistened between coats. When the second coat is dry, you will have a beautiful and moistureproof wall.




**Floor Repairs:** Leaky floors are sometimes the cause of wet basements. If the leak is slight or of the seepage variety, patching the cracks in the floor with the cement mixture suggested for the joint between the wall and the floor, will often suffice. Another effective remedy for floors is by means of the "iron method." This is a powder with an iron compound as a base, which is used to fill cracks and also to serve as a coating over the entire floor, to waterproof it. If used in the latter manner, however, it should be covered with a coat of shellac or aluminum paint to prevent the color from bleeding through, and one or two coats of floor or deck paint, followed by a coat of varnish. If the pressure of ground water has cracked your basement floor, causing the basement to be flooded periodically, the remedies suggested above will not be effective and more drastic measures must be employed.

A new floor must be laid on top of the old one with a watertight membrane between, to prevent water coming up through the new floor. The surface of the old floor, or as much of it as is leaky, usually the area around the walls, should be covered with two or three layers of burlap, which is mopped and cemented into place with hot pitch or tar, as shown in Fig. 14. Tar paper and asphaltum are sometimes used instead of burlap where the surface of the




old floor is reasonably smooth, with equally good results. The tarred burlap or paper should extend a distance of a foot or so up the side wall, to insure a tight corner. A coating of cement plaster, applied as previously described, to the wall, is carried down over the tarred portion, as in Fig. 16. The thickness of the new floor, which is laid directly upon the tarred membrane, as shown in Fig. 15, depends largely on the amount of upward water pressure that must be overcome. A 3-in. thickness of concrete, including the cement topping, is usually considered safe unless an unusual amount of pressure has been experienced. In such a case it may be necessary to use metal reenforcing and additional thickness, to make sure that the floor will not heave up under pressure.

**Excluding Sewer Water:** In many neighborhoods the sewerage system is inadequate or antiquated so that unusually heavy rains cause the sewer to "back up" and flood the basements. While this water soon drains out again, it leaves a deposit of silt and sludge that is decidedly unsanitary. A tight wall and floor are no protection against this nuisance as the water enters through the floor drain. There are a number of devices on the market for closing this opening if the water backs up. A simple screw plug can be used for this purpose. It must be screwed into place when a flood is expected or when leaving the house for a few days or longer. The only disadvantage is that one may forget to screw the plug in at the proper time. This difficulty is overcome by the ball-valve type of drain which permits water to run out of the basement, but closes when water backs up against it. The only possible objection to this type is that dirt will sometimes lodge in the valve and prevent it from functioning properly. Both the plug and the ball valve arrangements have one common fault—they may cause the floor to heave up if the pressure of the water backing up becomes too great.

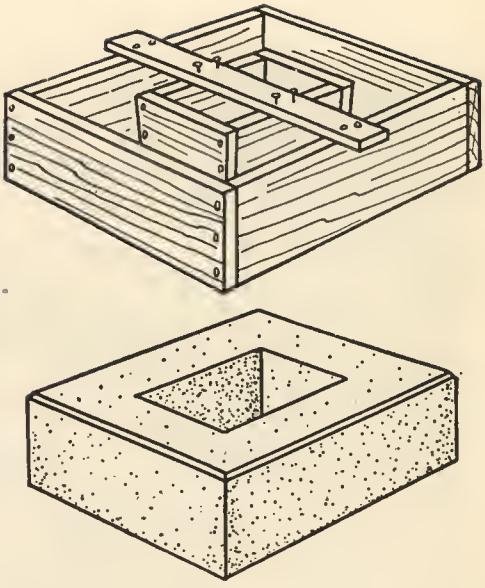
Perhaps the simplest device which is not open to the above objection, and is useful where there is little likelihood of water rising more than 2 or 3 ft. temporarily, is the standpipe shown in Fig. 17. This consists of a length of 4-in. iron pipe from 2 to 4 ft. long. The pipe is threaded at one end and two holes are drilled in the other end to take a 12-in. piece of ½-in. iron rod which serves as a handle. With this arrangement, water may rise to the level of the water head without overflowing into the basement. All pressure against the floor is relieved. Fig. 18 shows how the standpipe is installed.

Where water in basements may rise over 2 ft., or over the height of a basement toilet bowl, an effective temporary measure to stop "back-up" water consists in plugging the toilet bowl with a sack containing sand, a cement sack being just the thing for this purpose.

**Chimney caps**—In constructing a chimney cap, it is first necessary to take both inside and outside measurements of the chimney for which the cap is intended. Using these dimensions, 1 by 6-inch form boards are marked off, making allowance for the overlapping on the ends. When forms are assembled, the inner core, which has beveled sides to facilitate removal, is held in proper position by a strip nailed across the top of both forms. This strip helps prevent outer forms from bulging when the concrete is deposited and tamped in the forms. Form faces which will be next to the concrete mixture should be oiled.

The proper mixture for this class of work is given on page 2. Details of concreting should be done as described on pages 3 to 7.

For reinforcement lay No. 12 wires in the concrete as it is deposited. These wires should be bent to extend entirely around the cap about 1 inch from the outer edge. Forms may usually be removed in 24 hours.



**Dusting**—Disintegration of the surface of indoor concrete pavements into fine particles is known as dusting, and invariably is the result of poor workmanship or materials or both. Some of the causes of dusting are: Too fine and soft a sand; too lean a mixture; insufficient mixing; improper consistency; overtroweling when finishing; using dry cement to hasten the drying of the surface.

Two home treatments that have proven very successful and are inexpensive to apply are given below:

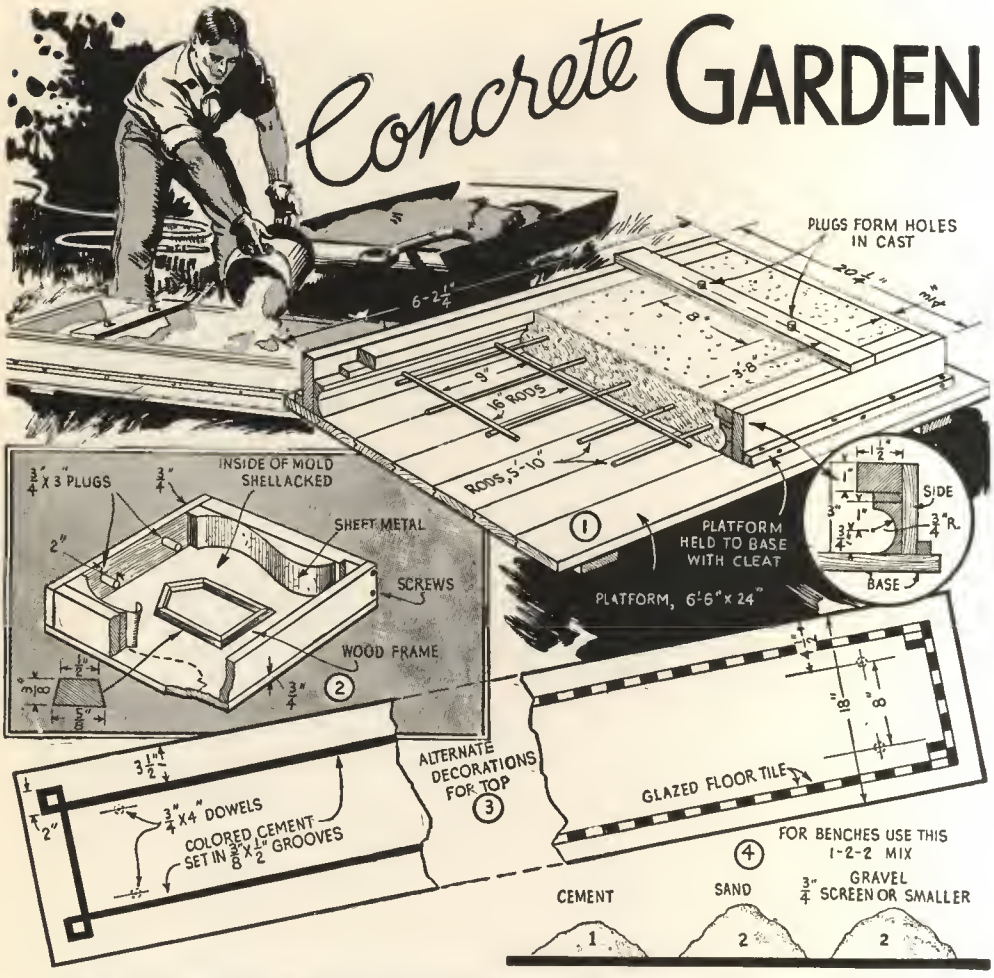
Commercial sodium silicate (water glass) usually varies in strength from a 30- to a 40-percent solution. It is very viscous and has to be thinned with water before it will penetrate. Ordinarily it will be satisfactory to dilute each gallon of silicate with 3 gallons of water. The resulting 4 gallons may be expected to cover 200 square feet of surface with one coat. The solution should be made up just before it is used.

Before the solution is applied the floor surface should be cleaned of grease spots, dirt, foreign matter, and thoroughly washed with clear water. To insure the greatest penetration, the floor should be thoroughly dry, especially at the first application; if practicable it is well to allow it to dry for several days after the first scrubbing. The solution may be applied with a mop or hair broom and should be brushed back and forth for several minutes to obtain even penetration. An interval of 24 hours should be allowed for each treatment to harden, after which the surface should be scrubbed with clear water and allowed to dry. Three applications will usually suffice, but if the floor does not then appear to be saturated a fourth will be required.

A solution of aluminum sulphate should be made in a wooden barrel or stoneware vessel. The quantity required may be estimated on the basis of 1 gallon of solution to each 100 square feet of area. For each gallon of water, 2½ pounds of powdered sulphate will be required. The water should be acidulated by adding not more than 1 teaspoonful of commercial sulphuric acid for each gallon. The sulphate does not dissolve readily and has to be stirred occasionally for a few days until the solution is complete.

The floor should be cleaned of grease and dirt and then thoroughly scrubbed. When the surface is entirely dry, a portion of the sulphate solution may be diluted with twice its volume of water and applied with a mop or hair broom. After 24 hours another portion of the original solution, diluted with an equal volume of water, should be applied. After another interval of 24 hours there should be a third application, 2 parts of the sulphate solution being used, to 1 part of water. At each application the liquid should be brushed back and forth over the surface for several minutes to obtain a uniform penetration. After the third application has dried the surface should be scrubbed with hot water.

# Concrete GARDEN




**There's no longer ony need to hove your gorden furniture in the dull gray of notural cement; just odd color pigment to the cement ond you can get almost ony effect from soft postel shodes to bright spots of color thot cotch the eye**

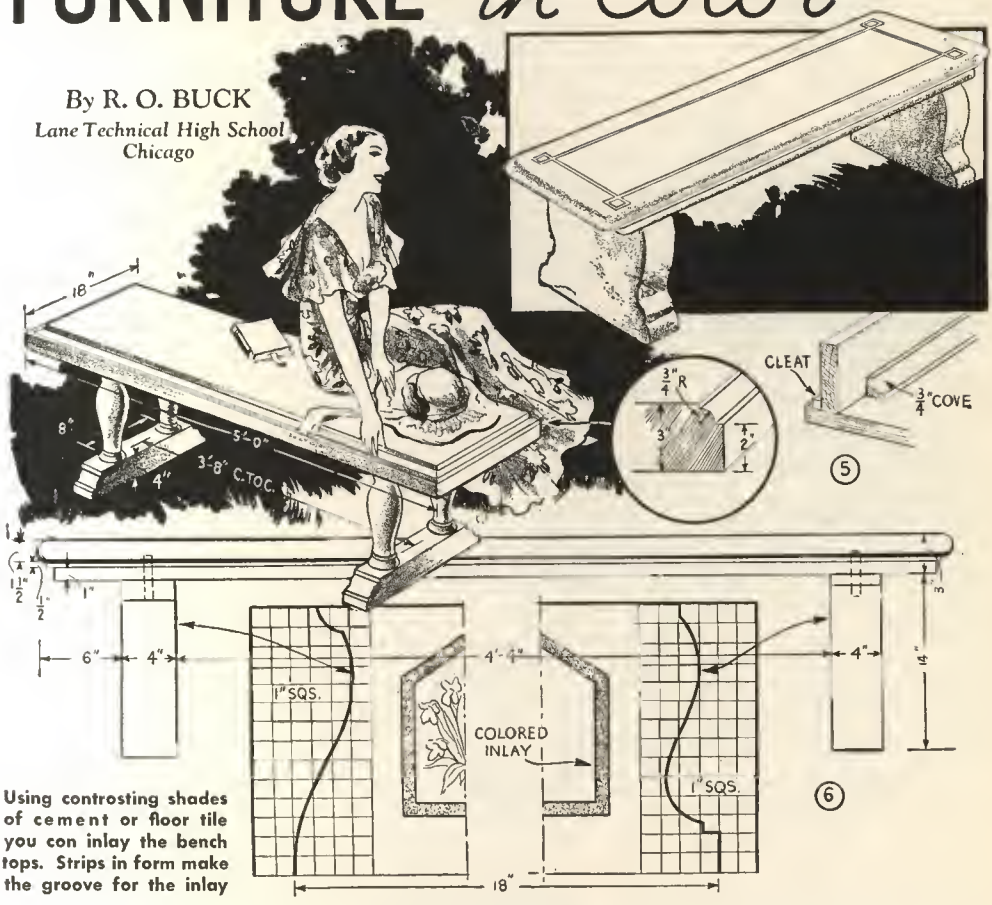
## Benches With Inlaid Designs

HAVE you ever thought how much more attractive concrete garden furniture would be if it were made up in colors that harmonize with the surroundings? Colored cement is the answer, and all you need to buy is the cement and the color. You can do the work yourself. Molding the parts is merely a matter of some pains in putting together a substantial form out of rough lumber. Then you have to be particular about the cement mix and see that it is thoroughly tamped into the mold to expel the air. And that's about all there is to it.

Fig. 1 starts you off with the form for the top of the bench shown at the right in Fig. 5. The top is cast upside down as in Fig. 1. This bench is made up of three members but requires only two forms. The frame of the top mold is built first, then the various pieces that shape the molded edge are nailed to the inner faces. The pieces are all screwed together so that after the concrete sets they can be removed piece by piece to avoid breaking the sharp edges. As the top is doweled to the ends, four plugs, spaced as shown in Fig. 1, are used to cast the holes. The plugs should fit fairly loose so that they may be removed easily. All concrete forms

# FURNITURE *in Color*

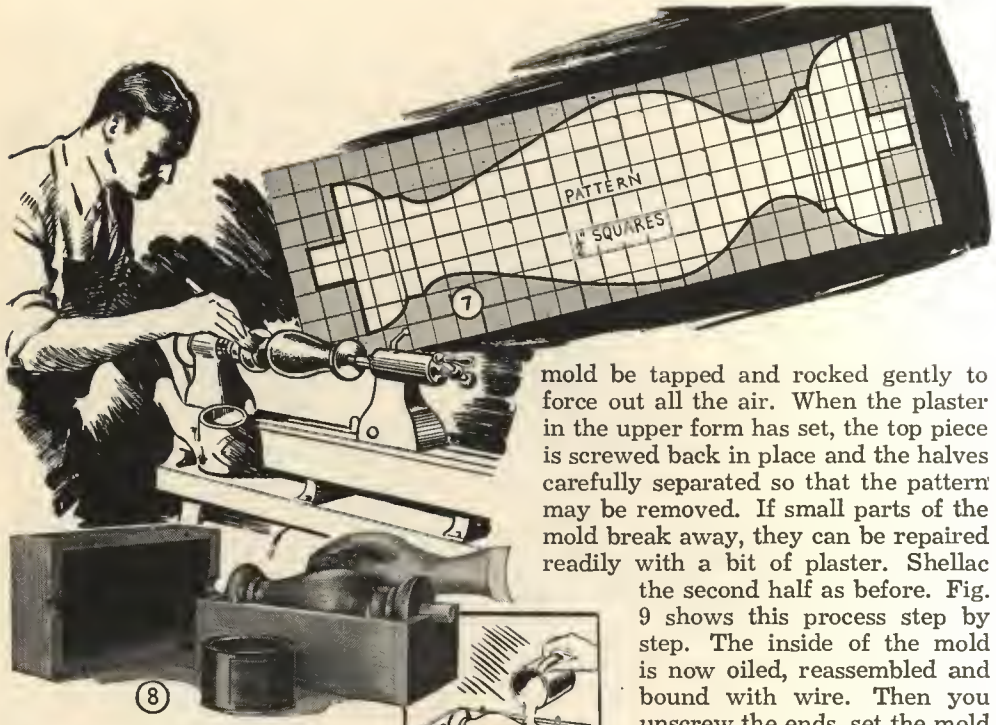
By R. O. BUCK
*Lane Technical High School*
*Chicago*




**Using controsting shades of cement or floor tile you con inlay the bench tops. Strips in form make the groove for the inlay**

should be shellacked or painted at least two coats on surfaces that come in contact with the wet mixture. Also, just before casting, the surfaces should be covered with a thin film of oil. No. 20-W crankcase oil is about right. The cement mixture, Fig. 4, is tamped into the mold to a depth of about 1½ in. after which the reenforcing rods are laid in position as in Fig. 1. Care must be taken that the ends of the rods are at least an inch from any surface. The end form is built up as in Fig. 2, the size and possible variation in the center ornament being given in Fig. 6. Molds of this type are filled from the side. Curved blocks are cut out on the band saw to form the sides, as in Fig. 2. Placing the plugs for the dowels, laying the reenforcing rods and filling the mold varies little from the process just described for the top.

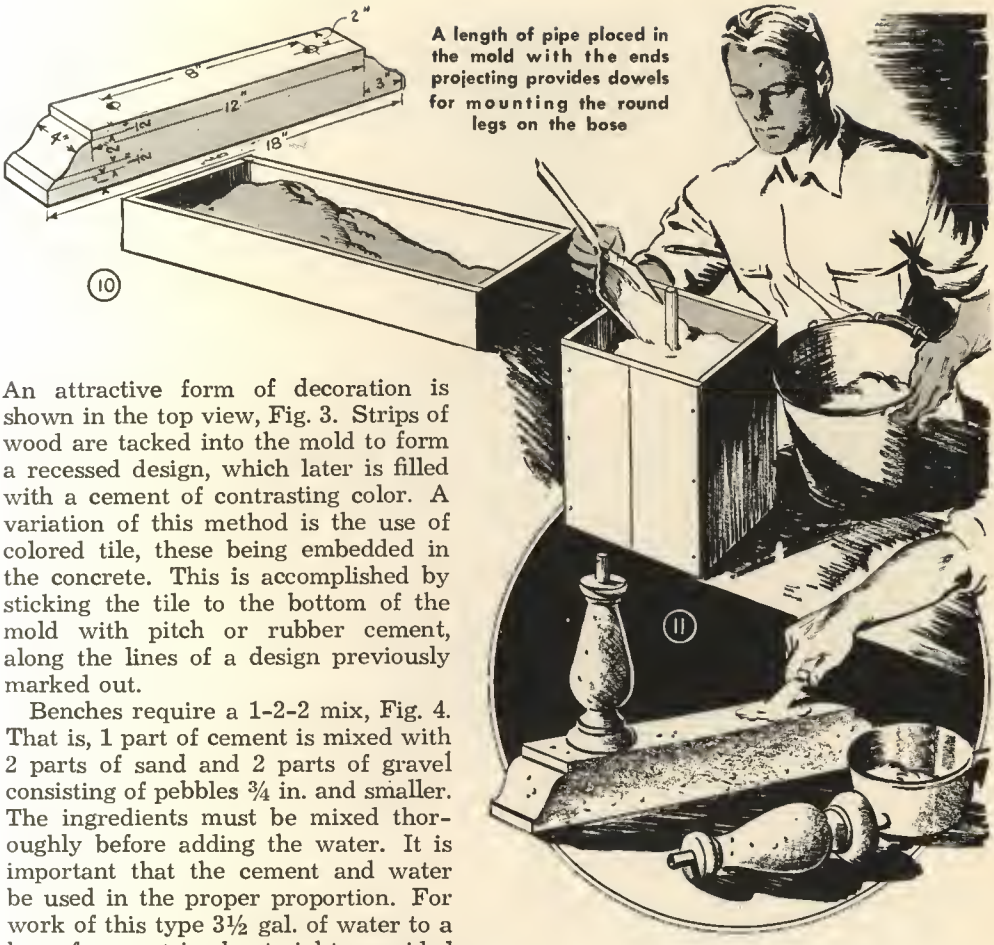
A second and somewhat more difficult design, shown at the left in Fig. 5, consists of seven members but requires only three forms. The construction of the top mold is similar to the one previously described, making use of a simple cove to form the edge, as in the details in Fig. 5. The base pieces are cast in a simple mold, the construction of which is shown in Fig. 10. Only the bottom is fastened with screws. The sides are nailed as they need not be removed to take out the finished casting, due to shrinkage. Two reenforcing rods are suggested. The mold for the leg pattern is made with casting plaster. A




**Laak at the lower bench in Fig. 5, then at illustrations abave, and yau'll see haw the legs are made in a plaster-of-paris mold. By packing the plaster about the pattern in the two halves af the mald the latter can be parted and pattern removed**

wood pattern is turned up on the lathe and shellacked while still mounted, as in Figs. 7 and 8. Next, you build a box large enough to permit packing about 1 in. of plaster all around the pattern, except at the ends. Use screws to fasten all pieces together. After boring holes in each end large enough for a ½-in. pipe, the box is sawed through the center. When the inside surfaces of both halves, as well as the pattern, have been shellacked, as shown in Fig. 8, the mold containing the pattern is filled with plaster of paris and set aside for about 24 hours. Shellac and oil the surface of the plaster to form a parting, then put the empty half of the box in place, remove the top and again fill with plaster. In both pourings it is important that the mold be tapped and rocked gently to force out all the air. When the plaster in the upper form has set, the top piece is screwed back in place and the halves carefully separated so that the pattern may be removed. If small parts of the mold break away, they can be repaired readily with a bit of plaster. Shellac the second half as before. Fig. 9 shows this process step by step. The inside of the mold is now oiled, reassembled and bound with wire. Then you unscrew the ends, set the mold up and insert a piece of ½-in. pipe long enough to extend 2 in. beyond the plaster at both ends. The mold is filled with a "soupy" mixture of equal parts of sand and cement. This molding process is repeated until four spindles are produced. The spindles are doweled into the base and top by means of the pipe, the joints being set in a paste made with cement and water as in Fig. 11. A layout for a curved bench top is shown in Fig. 14. The method of casting is similar to that described except that there are six spindles and three bases.


Now something about the possibilities of decoration: One of the simplest ways to decorate the ends of the first bench described, is by means of depressed panels. Fig. 12 shows a pleasing design with this ornamentation. Another feature of the design is the stepped base, which is produced by a mold of the type shown in Fig. 13.



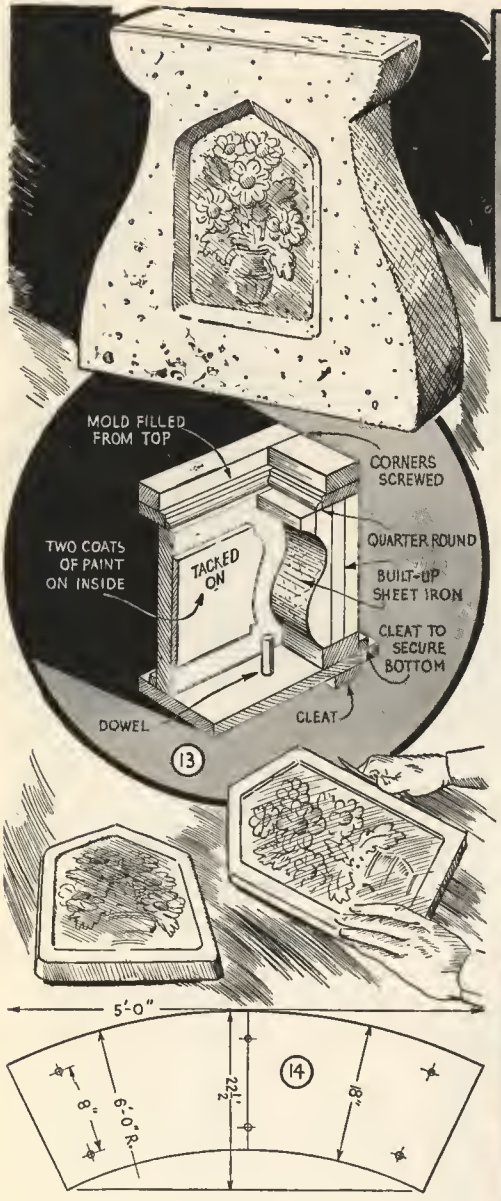

A length of pipe placed in the mold with the ends projecting provides dowels for mounting the round legs on the base

An attractive form of decoration is shown in the top view, Fig. 3. Strips of wood are tacked into the mold to form a recessed design, which later is filled with a cement of contrasting color. A variation of this method is the use of colored tile, these being embedded in the concrete. This is accomplished by sticking the tile to the bottom of the mold with pitch or rubber cement, along the lines of a design previously marked out.

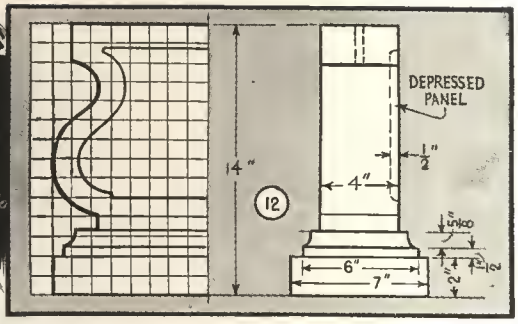
Benches require a 1-2-2 mix, Fig. 4. That is, 1 part of cement is mixed with 2 parts of sand and 2 parts of gravel consisting of pebbles ¾ in. and smaller. The ingredients must be mixed thoroughly before adding the water. It is important that the cement and water be used in the proper proportion. For work of this type 3½ gal. of water to a bag of cement is about right, provided the sand is rather wet, as is usual. In case a trial batch proves too dry or too watery, it should be brought to the right consistency by adding or omitting some of the gravel; never by adding or omitting water. Your mix should be semi-dry.

Color is obtained in two ways, by mixing mineral colors with the cement to obtain color throughout the piece or by applying a colored mortar with a stiff brush to the surfaces. Less skill is required to get a uniform shade where the color is mixed with the cement. Then the color will be durable, but as a considerable quantity is required, the cost will be greater than that of applying a colored mortar. The color pigment is added to the dry cement and thoroughly mixed, then sand and gravel are added as described above. When light shades are desired, white crushed stone should be used instead of gravel. If the color is to be painted on the work, the pigment is mixed with cement and enough water added to produce a mix with the consistency of cream. This mix is then applied to the work with a stiff brush. Only mineral colors should be used for cement as other pigments are likely to fade or reduce the strength of the mixture. Never add more than 10 per cent, by weight, of pigment to the dry cement as taken from the bag. Varying the amount of pigment varies the exact shade of color. White cement is mixed with color to obtain pastel shades. It's well to remember that the color is considerably darker when wet.

Now it is very important that the dry ingredients, that is, sand, gravel, cement and color pigment, be thoroughly mixed




before you add any water. The box in which you place the various materials should be sufficiently large to hold a complete mix for one bench, otherwise you may have some difficulty getting the proper shade of color. Another thing to look out for is foreign matter such as leaves, small twigs, dirt and pieces of paper. The presence of any one of these will cause trouble in the mold. When you pour the




**Variation in the ornamental panels of the bench end pieces is passible. Far instance, the end can be cast with a stepped base and a plain depressed panel as in Fig. 12. Perhaps you will want ta carve a flawer or leaf design on the sectian that farms the panel, with a result like that shawn at the upper left**

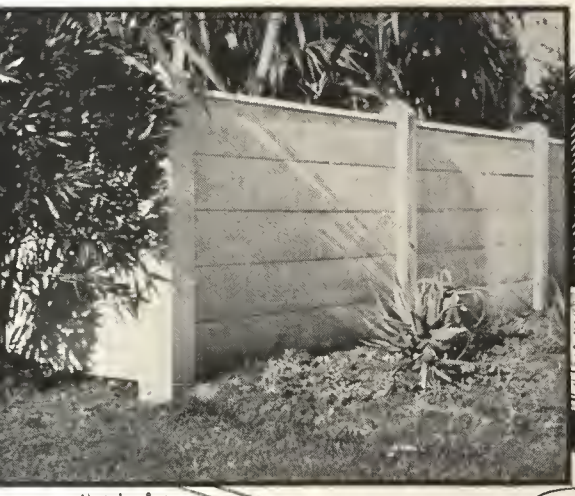
mixture into the mold, it must be tamped to expel the air and assure even distribution.

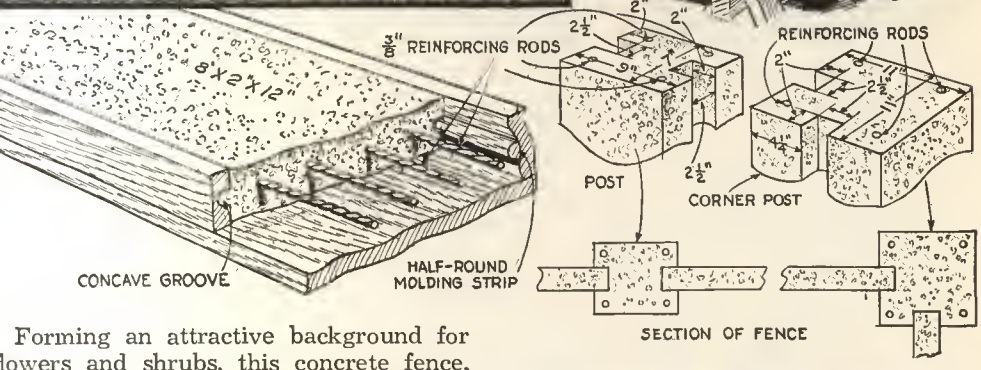
Concrete work must always be cured to prevent its drying too rapidly and producing a crumbly job. Leave the pieces in the mold about three days, keeping the casting moist by covering with burlap, which is sprinkled from time to time. Pieces should be protected from the sun and wind and kept moist several days after removing from the mold.

## Bolts Held in Concrete Forms by Wood Strips


The amateur concrete worker who has trouble in holding anchor bolts in concrete forms while pouring, will find that this method solves the problem. Wood strips, drilled to take the bolts securely, are nailed across the tops of the form at the locations desired for the bolts.

# Solid Fence of Concrete "Boards" Gives Privacy






Forming an attractive background for flowers and shrubs, this concrete fence, which is cast in sections and then assembled, will last indefinitely. Forms for the casting job are easily made. The concrete planks are 2 in. thick, 12 in. wide and 8 ft. long, and are reinforced with four ⅜-in. rods, while the posts are 7 by 9 in. by 8 ft. long with 1 by 2-in. grooves cast in the sides to receive the ends of the planks. The posts are also reinforced with rods placed 1 in. from each corner. To make the fence tight, one edge of each plank has a tongue cast on it while the other side has a groove cast in it. Use a stiff concrete mixture and tamp it firmly into the forms. When setting the posts, they must be spaced accurately so that the ends of the planks fit perfectly into the grooves.

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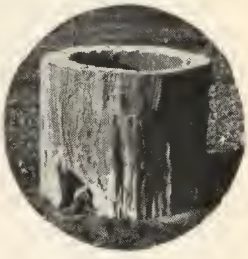
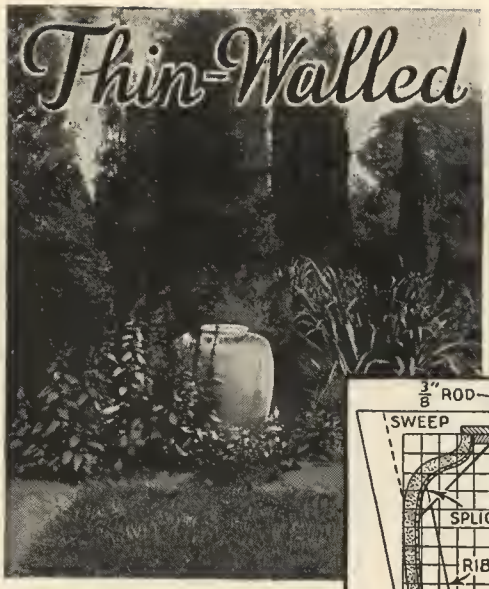
Water used in mixing concrete should be clean, free from oil, alkali, and acid. In general water that is fit to drink is good for concrete.

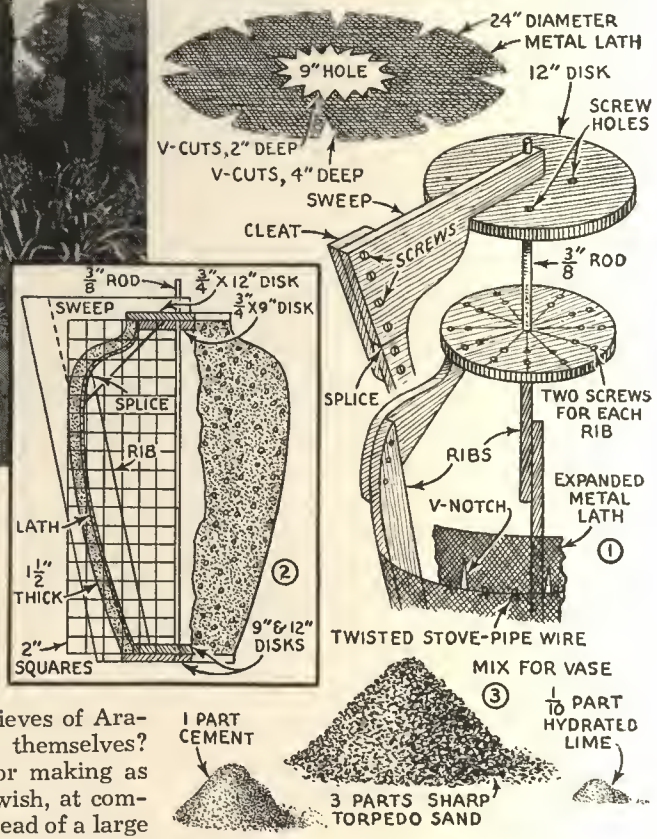
## Park Incinerator Resembles Stump



Concrete incinerators that resemble hollow tree stumps are easily made. An oil drum was first placed in the designated spot and loosely wrapped with fine poultry wire. Then several straight sticks were inserted between the netting and the drum and concrete mixed rather dry was packed between the drum and sticks. After the concrete had set, the sticks were removed and the drum lifted out. Then the inside of the wire was plastered with cement and a hole was made on one side at the ground line for draft. The sticks formed deep grooves in the outside of the incinerator to resemble bark.

# Thin-Walled CONCRETE






**Garden Vases, Urns and Window Boxes**

HAVE you ever had a "yen" to decorate your garden with large colored vases so reminiscent of the oil jars in which the forty thieves of Arabian Nights fame concealed themselves? Here is a brand new idea for making as many of these vases as you wish, at comparatively little expense. Instead of a large mold, the vase is cast or formed over a riblike framework covered with expanded metal lath as in Figs. 1 and 5. The cement is simply plastered on in three layers.

Fig. 2 shows a squared layout of the ribs and the method of construction. Twelve ribs are bandsawed to the shape shown and are assembled between the disks, as in Figs. 1 and 4. The form is then ready for the expanded metal lath. One sheet, 4 by 8 ft., is sufficient, if care is taken in cutting. Starting at the top, a circular piece as in Fig. 1 should be cut out with snips and formed over the top of the frame. Great accuracy is not required beyond getting the material into the approximate contour of the frame. The V-cuts are made wherever required and are drawn together with short lengths of soft iron wire, as are all other connections between pieces of the lath. After the neck and shoulder have been covered, the balance of the surface is wrapped with strips of the material as shown in Fig. 5. The lath is not fastened to the wood at any point as this would prevent removal of the frame after the concrete has set. The outside contour of the vase is formed with a sweep, as shown in Fig. 6. The sweep is pivoted at the top by means of a rod which runs through the top and bottom disks. The larger outside disks are screwed on at both the top and bottom to provide a guide for the sweep and also to assure uniform thickness.

There are a few simple precautions to be observed in preparing the cement. It must be fresh and dry. Cement which contains lumps has partly set from absorbing moisture and lacks the adhesive properties required for this type of work.

# POTTERY··· *made without Molds*

The sand must be sharp—torpedo—and free from the presence of loam. The mix, Fig. 3, consists of cement, 1 part, sand, 3 parts, and hydrated lime, 1/10 part. After these have been well mixed, enough water should be added to make a "fatty" consistency. The mixture should stand an hour before applying, to "jell." The purpose of the lime is to make the mix more plastic and adhesive. It also whitens and waterproofs the mixture. The cement is applied with a trowel in three layers, each approximately ½ in. thick. Smoothing the first two coats is unnecessary, as a rough surface helps to bond the succeeding layer. Apply the coats a day apart. Fig. 7 shows how the last coat is trued up. Burlap or old carpeting is wrapped around the finished work as in Fig. 8 and kept wet several days to allow the concrete to "cure." This is important as a crumbly vase will result if the drying takes place too fast. Now, the top and bottom disk are unscrewed, and by a bit of manipulating each of the twelve ribs is removed through either the top or bottom openings.

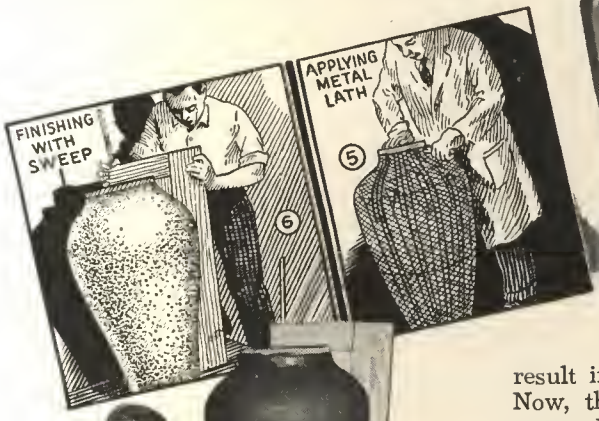
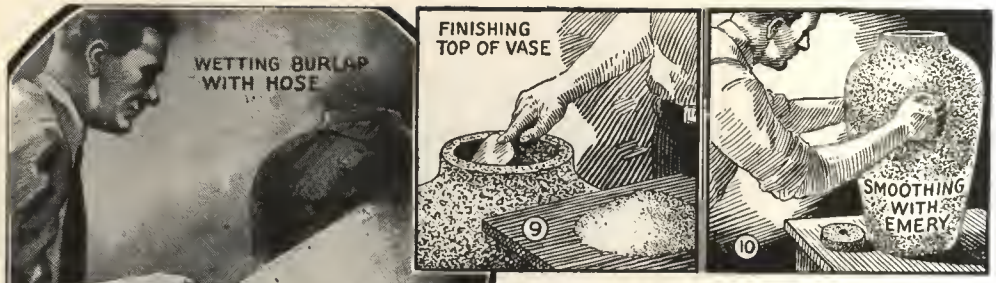





Fig. 9 shows how the rim and inner surface of the neck are finished off with a rich cement mixture, the surface being thoroughly wet before this patching is attempted. As the rest of the interior will be covered by soil it need not be smoothed. If the surface of the vase shows trowel marks or other irregularities, it can be smoothed down by scrubbing it, while



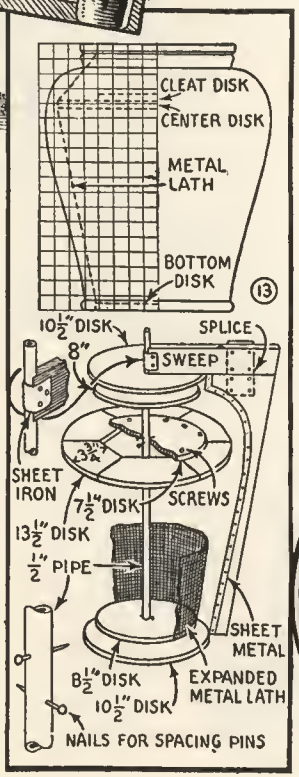


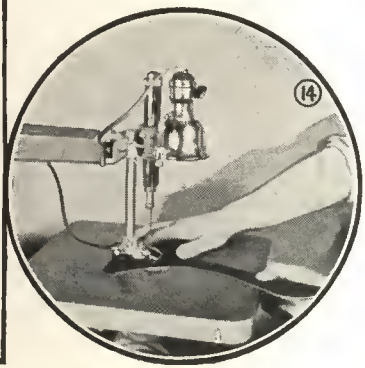


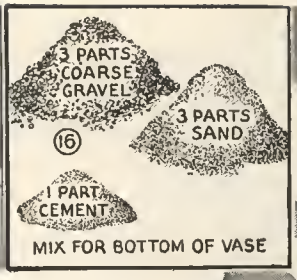

wet, with an old emery wheel dipped in water as in Fig. 10. Small depressions are readily filled with a mortar of cement and water. Be sure the surface is wet so that the mortar will adhere, and keep it moist for several hours after patching.

Now for the color. Clean off all dust and loose particles with an old scrubbing brush as in Fig. 11, and wet the vase down thoroughly again to prevent the porous surface from absorbing the water out of the paint before the latter has had a chance to set. The moisture also gives an easy flow to the paint. The first coat of the cement paint is mixed by adding paint, in powder form, 2 parts, to water, 1 part, stirring constantly while adding the powder. Apply with a stiff brush, as evenly as possible as in Fig. 12. The second coat is applied in a similar manner, using paint, 2½ parts, to water, 1 part, to produce a thicker paint. Each coat should be wet down as soon as it has hardened enough so that it will not run when the water is applied. The piece should be kept under wet burlap for 24 hours after each painting. Cement paint is available in white, black, cream, grey, red, spanish buff, green and blue, and the dry colors can be mixed to produce many other shades.

The bottom should be formed as in Fig. 15 after the piece has been set in place so that it will not be so heavy to handle. It is necessary to pour in only about 3 in. of a mix containing coarse gravel, 3 parts, sand, 3 parts, and cement, 1 part, as in Fig. 16. This will produce a porous bottom



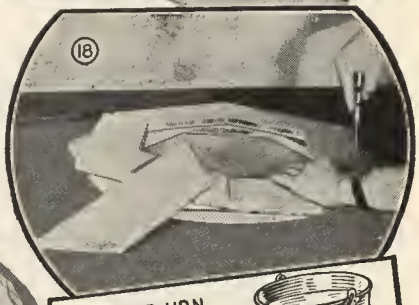



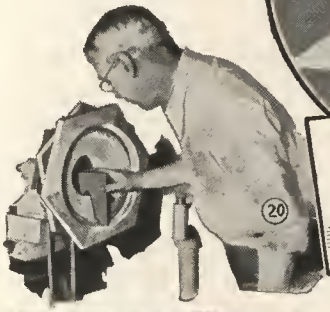



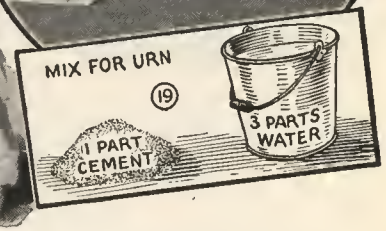


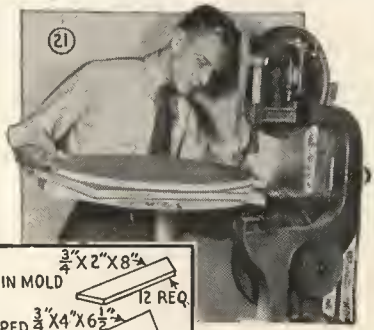
that will provide drainage. The vase is then half filled with coarse gravel and the remaining space with black soil.

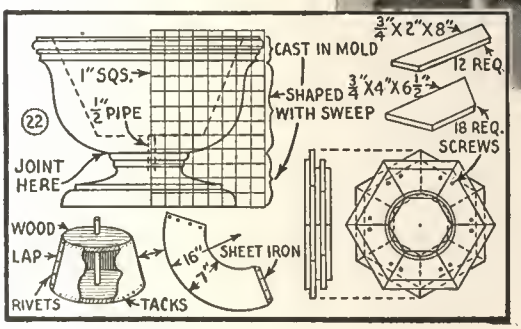
A proper setting adds much to the beauty of your vase. Fig. 24 suggests an arrangement consisting of a circular pad for the vase, surrounded by cast flagstones. Molds are made for casting the flagstones and the circular pad, the latter being built up with segments which are cut to shape on a band saw. A wagon tire would serve this purpose, if available. A pleasing effect is obtained by partly surrounding the vase with shrubs or flowers. Floodlighting is effective at night. The vases are usually used simply as garden ornaments, though they are equally attractive for use in pairs before an entrance. Vines or small evergreens may be planted in them but the usual practice is to leave them empty, except for the soil. In climates where freezing would be likely to crack the vase, it is advisable to provide



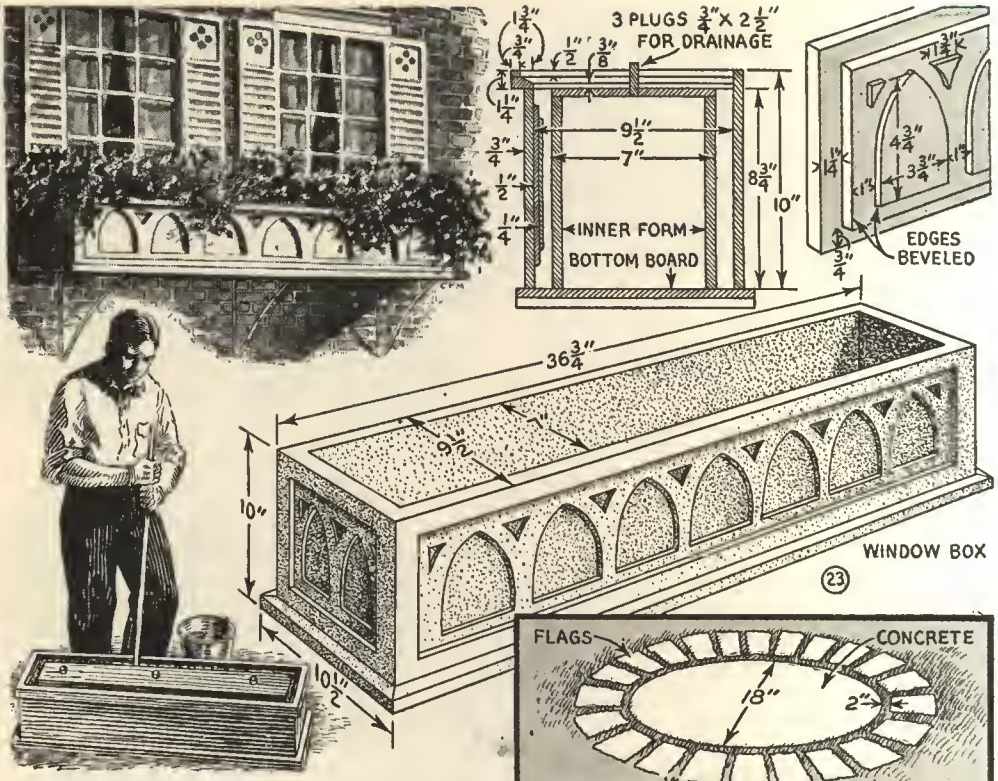



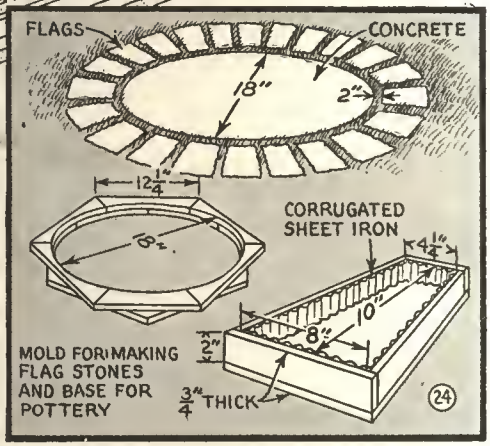




a wood or metal cover to prevent the entrance of snow and rain, in winter.

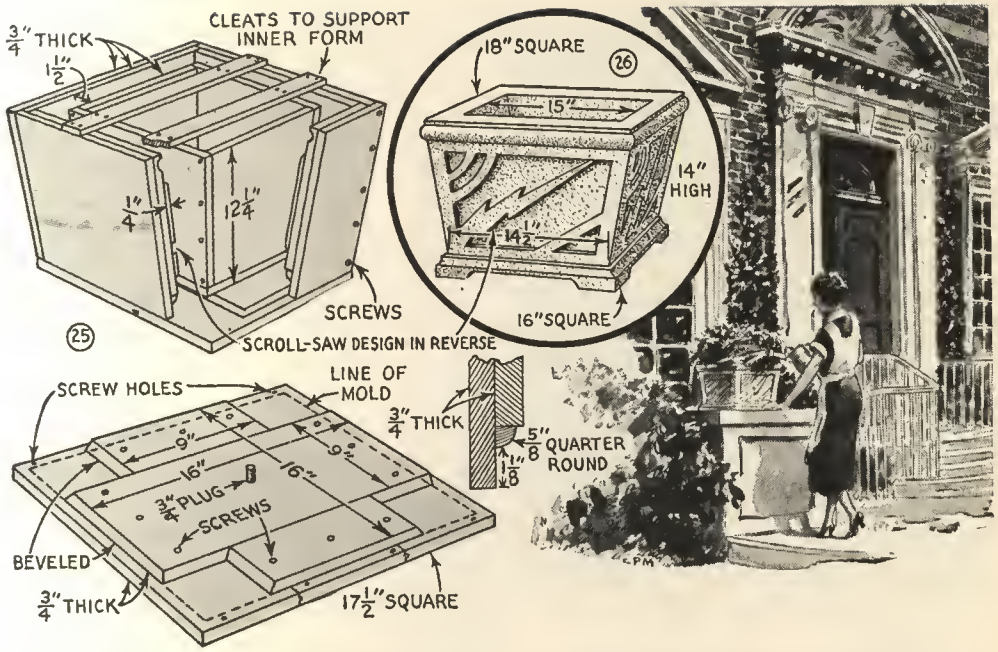
The wide-mouthed jar in the photo above Fig. 4 shows another attractive finish for concrete work of this kind. The outer surface of this piece looks like marble, the effect being obtained by using aggregates of white sand and marble chips. The mix is prepared in the usual way and the surface finish is produced by scrubbing off the film of cement with a stiff brush and water, or with an emery stone, as previously described. Granite screenings, crushed felspar, slag or other colored rock materials are obtainable and may be used




in a similar manner. A method of casting these large-mouthed jars is shown in Fig. 13. The form for the jar consists of a series of disks, the center one of which is made up segments, held together by a smaller disk and screws. The outside is covered with metal lath, as before, and the concrete plastered on in layers. Nails pushed through holes drilled in the length of pipe, space the disks. After the job has set, remove the top and bottom disks, unscrew the small center disk and the six segments can be removed readily for use on a repeat job. The contour of the base is given in the squared detail, Fig. 13, and the curve of the sweep may be taken from this. The sweep is faced with thin sheet metal cut to shape on the jig saw as in Fig. 14.

Flower urns, of the type detailed in Fig. 22, are easily made if you have a lathe equipped so that you can turn on the outside of the headstock. The method, as shown in Fig. 17, is a combination of sweeping and molding. Five sets of segments are required for the base, as shown in Figs. 18 and 22. The base is turned in two sections, the first two layers of segments being mounted on the faceplate and turned to approximately the curve required. Then the second section of three layers is screwed on and the curve turned to a template as in Fig. 20. The slowest speed on the lathe should be used when turning large diameters. When the mold is complete it is given two coats of shellac and one of machine oil to prevent the cement sticking. The mix for the urn, Fig. 19, should be cement, 1 part, and water, 3 parts, mixed fairly thick and thoroughly tamped into the mold. As the segments are held together with screws, it is an easy matter to remove but one segment at a




time and thus avoid damaging the cast. The pattern for the upper rim of the urn is made in a similar manner but requires only two rows of segments. Because of the large diameter, it is necessary to bandsaw the segments and mounting disk as nearly round as possible, as shown in Fig. 21, to prevent excessive throw or vibration. The inner form is made of sheet metal and assembled on wood disks, as shown in Fig. 22. The setup for casting the bowl is shown in Fig. 17. A sweep, lined with a piece of sheet iron, is used to produce the outside contour. The surface treatment is a matter of choice.

Cement flower boxes, if not too massive, are always attractive, and by the use of colors pleasing effects can be obtained. The rectangular window box, shown in Fig. 23, is ornamented on the face and ends with a series of depressed panels which may be painted in contrasting colors. Details of the mold construction and a section through the center are also shown in Fig. 23. The box is cast upside down. The flower box shown in Fig. 26 is ornamented with a modern design requiring bright coloring for a pleasing effect. A combination of red, yellow and aluminum is suggested. The latter cannot be applied until the piece has thoroughly dried out, however. A detail of the base, showing how the opening between the feet is produced, and the method of constructing the mold are shown in Fig. 25. Shellac and oil must be used, as previously described, and it is advisable to screw all parts together for safety in removal. The cement mix for the flower boxes is the same as for the urn and thorough tamping is equally essential for a good casting.

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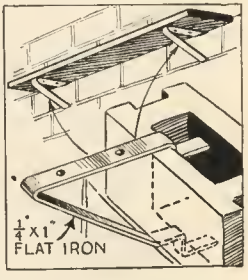
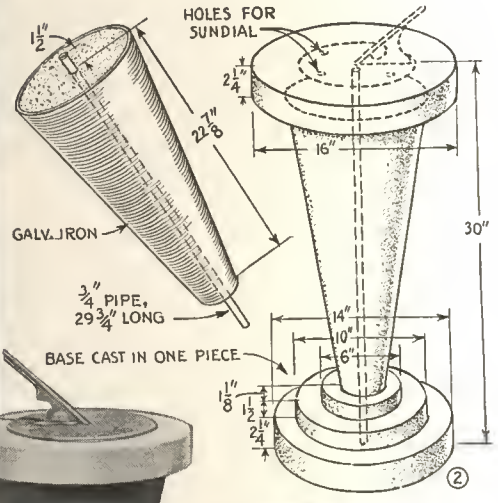
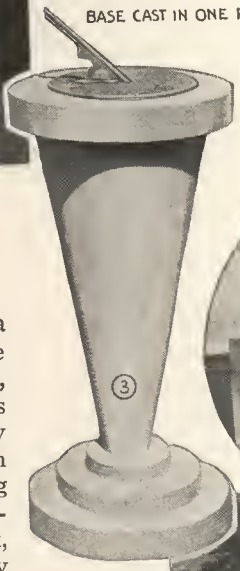
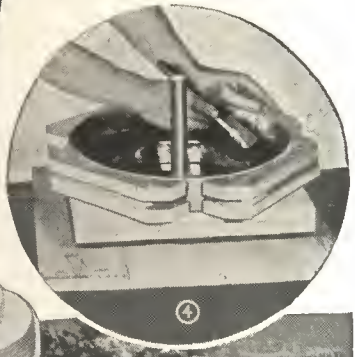
**Brackets anchored in wall**—When laying a concrete foundation for his home, one workman installed brackets for the shelves in his fruit cellar as indicated. These were shaped from flat iron and were put in place as the wall was laid, thus assuring that they would be anchored securely and permanently. The same idea can be adapted when laying up any wall of concrete blocks where shelves are likely to be desired on the inside. The brackets can be placed between every row of blocks if necessary, although every second row usually is better, as this gives a wider spacing of the shelves.



# BIRD BATHS and



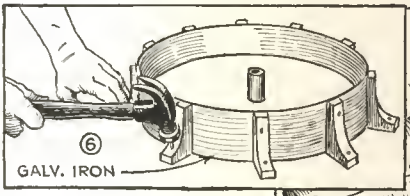
## Casting Round, Fluted and Tapered Columns

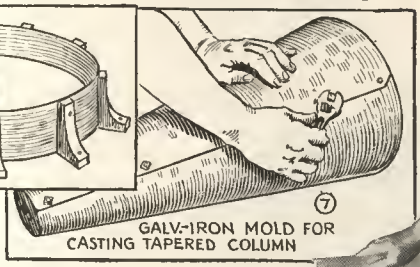
COLORED cement has opened up a new and interesting field to the home craftsman, who can cast durable, attractive garden ornaments, such as bird baths, sundial pedestals and many other objects of a similar nature, with very little expense. To speed up setting and curing you can add a small quantity of calcium chloride to the mix, which will cause it to set sufficiently overnight so that the form or mold can be removed.

The cone-shaped sundial pedestal, shown in Fig. 3, is especially suited to the use of colors. A pastel shade of green on the top and base with a blending of greens and yellows on the cone-shaped standard is effective. This effect is obtained by simply applying white cement to which enough mineral color has been added to produce the desired shade. Blending is accomplished by brushing patches of a contrasting color over a wet coat. It is advisable to cover the freshly painted work with burlap or canvas, Fig. 9, as soon as the color has set enough so that it will not run when water is applied. The piece should be wetted down thoroughly and the burlap kept damp for a day or two to assure a good bond. Fig. 2 gives the general dimensions of the three units that make up the pedestal. These

# SUNDIAL PEDESTALS

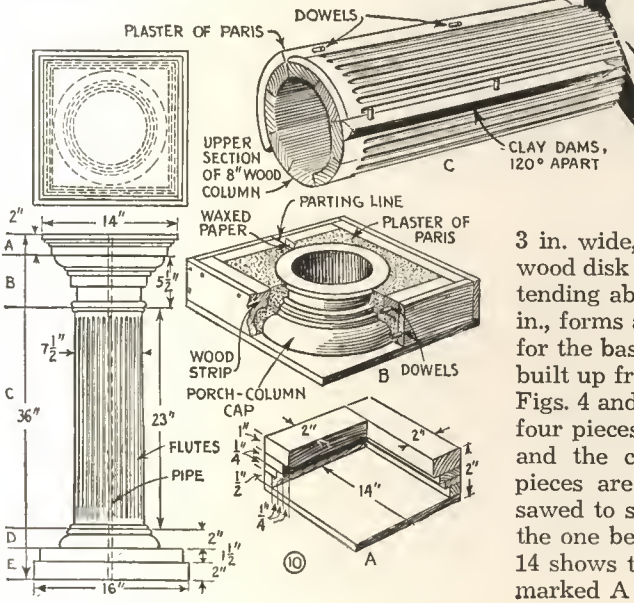
## *in Colored Cement*



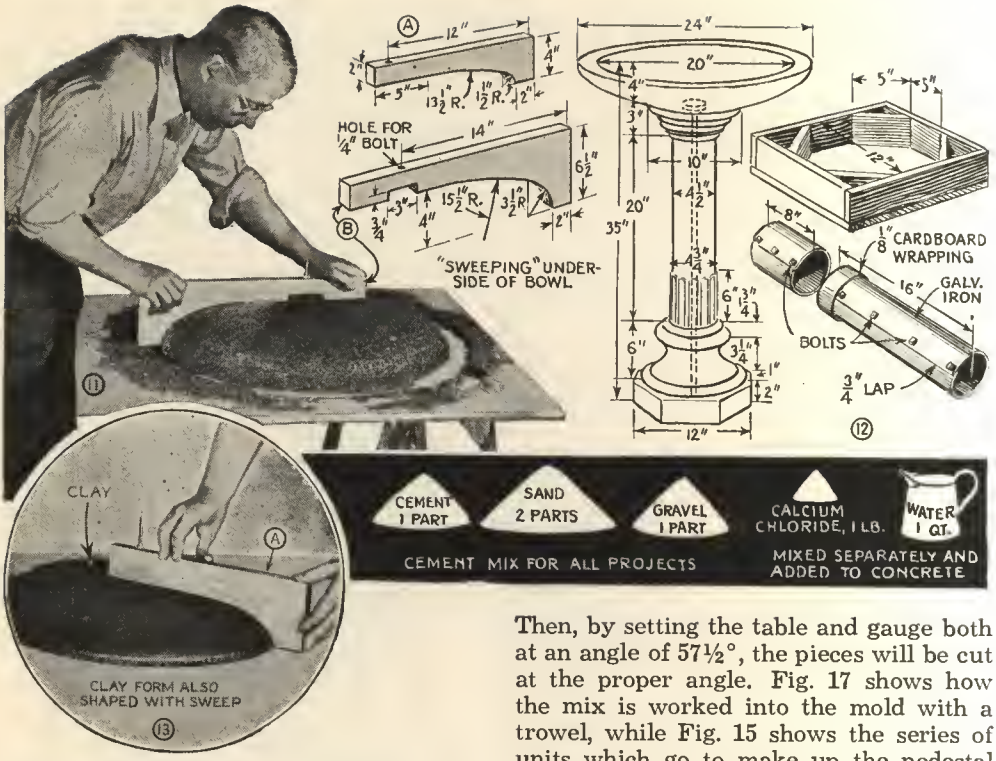





are held together by means of a piece of pipe, which also serves to reinforce the cone. It is advisable to put pieces of wire in all of the units as this adds greatly to their strength. Dimensions for laying out the cone form on galvanized iron are given in Fig. 14, the form being closed with a tapered wood plug, which is bored in the center for the pipe. The lap joint on the metal cone is fastened by oval-head machine screws with the nuts to the outside, Fig. 7. The cone can be supported as in Fig. 8 which also shows how the concrete is "struck off" level. The mold for the top disk is made from a strip of sheet iron,


3 in. wide, formed around a ¾ by 16-in. wood disk as in Fig. 6. A piece of pipe extending above the bottom of the mold 1½ in., forms a hole in the casting. The form for the base, which is cast upside down, is built up from layers of wood, as shown in Figs. 4 and 14. Starting at the bottom, the four pieces are mitered, tacked into place and the circle scribed, after which the pieces are removed and the arcs bandsawed to shape. Each layer is fastened to the one below it with finishing nails. Fig. 14 shows the shape and size of the layers marked A and B. The top view gives the

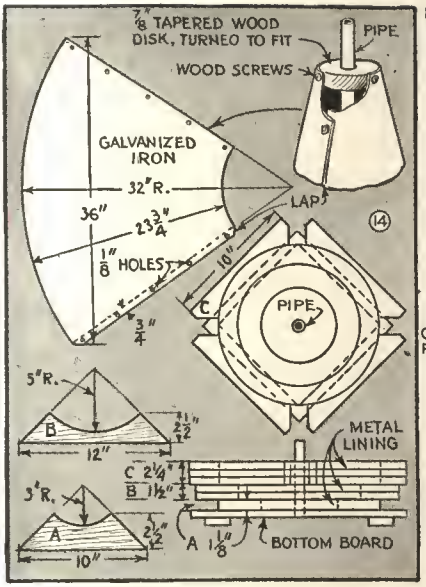


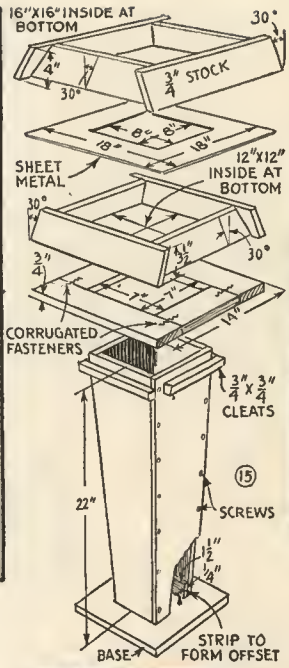

dimensions for the layers marked C. The inside surfaces of the three concentric circles are lined with strips of sheet metal.

Surfaces of the molds that come into contact with the concrete should be given two coats of shellac, then oiled thoroughly just before filling. The mix for all of the projects described should be in the proportion of cement, 1 part, sand, 2 parts, and fine aggregate, containing pebbles no larger than ½ in. in size, 1 part. Calcium-chloride, 1 lb., is added to water, 1 qt., and stirred until it is thoroughly dissolved. This quantity of the solution is sufficient for one-half bag of cement when added to the mixing water, the quantity of the latter being cut down to allow for the added volume of the solution.

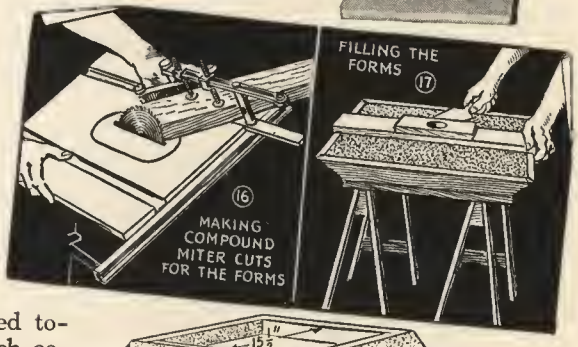
A modern bird-bath design is shown in Fig. 18, the sharp reversed angles producing a striking effect. Strong blues, reds and yellows are suggested for effective contrast. Construction of the tray involves compound miters, which can be easily cut on a circular saw by first setting the table at an angle of 47½°, Fig. 16, to cut the bevels on the edges of the pieces. Then, by setting the table and gauge both at an angle of 57½°, the pieces will be cut at the proper angle. Fig. 17 shows how the mix is worked into the mold with a trowel, while Fig. 15 shows the series of units which go to make up the pedestal and base mold, and the order in which they are assembled. The base pieces are set at an angle of 60° with a miter cut on the ends of only two of the pieces in each set. The saw table should be set at 71½° and the gauge at 60° for these cuts. Success of the work depends on thorough tamping and ample reinforcing with wire and four ¼-in .rods which run from top to bottom near the corners. As screws are used throughout, it is only necessary to take the form apart after the concrete has set thoroughly.

If you are interested in the classic type of ornament, refer to the design shown in Fig. 1, which is exceptionally beautiful when finished in pure white cement. The pattern for the column of this piece, the dimensions of which are given in Fig. 10, is made from a section of fluted porch column. A plaster cast of the column C is obtained by forming clay dams 120° apart on the column, producing a three-part mold in this manner. As soon as one section has set, the clay is removed, the column is turned and another section cast in the plaster. A strip of burlap should be



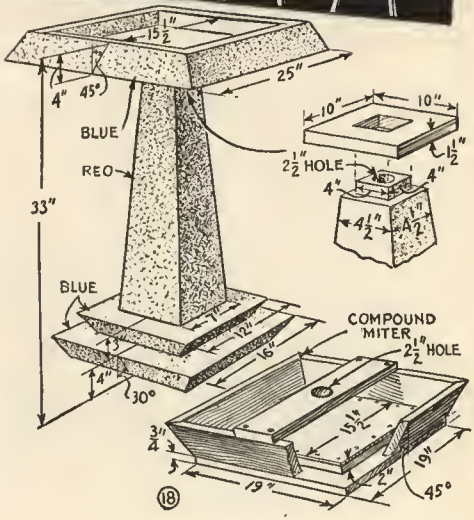







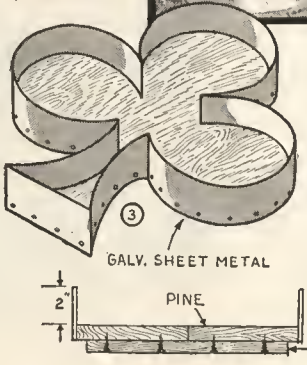

embedded in each section of the cast to strengthen it. The circular portions shown at B and D, which can also be obtained from the column or turned out to suit, are cast in plaster, the mold being arranged to part at the center. Remember that all patterns and inside surfaces of plaster casts must be shellacked and oiled just as for a cement mold. The top and bottom sections marked A and E are cast directly in a wood mold. The various units are then fastened together with a piece of pipe and rich cement mortar.

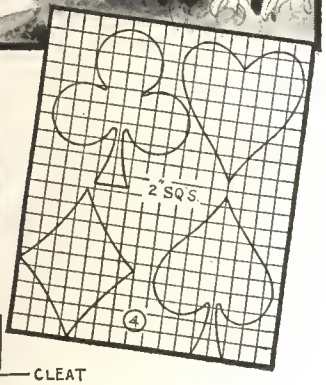
The circular bird bath shown in Fig. 5 is cast in five units. The bowl is formed by means of the sweeps A and B, shown in Fig. 12. A clay form of the inside of the bowl is shaped with a sweep as in Fig. 13. This is covered with concrete, the larger sweep substituted and the outer surface formed as shown in Fig. 11. The scheme for forming the column is shown in Fig. 12. Metal tubes are used to cast the piece, after which the ornamental lines are scraped in with a triangular file ground to a V-point on the end. The octagonal base is cast in a wood form, Fig. 12. The remaining sections must be turned in wood and a plaster mold formed as previously described.



# "Playing-Card" Stepping Stones of Concrete

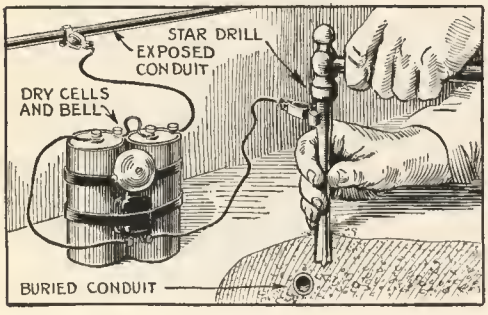

Unusual walks can be produced with concrete stepping stones cast to resemble symbols on playing cards. The stones can be laid in blocks to simulate playing cards, or arranged in other designs. And, if desired, a thin layer of colored concrete can be applied to each stone as it is cast. This is done after the forms have been filled by sprinkling colored pigment on the wet concrete, Fig. 1 and then puddling it in, Fig. 2. The forms are made as in Fig. 3, the size being taken from the squared diagram, Fig. 4. The concrete is mixed in the proportions of cement 1 part, sand 2 parts, and gravel 3 parts. If the aggregate is dry, use water in the proportion of 5½ gals. to each sack of cement, but for moist aggregate, use water, 4¼ gals. This proportion is important for enduring concrete. Keep the concrete covered with damp burlap until it has set properly.




## Electric Bell Detects Pipes Which Are Buried in Concrete

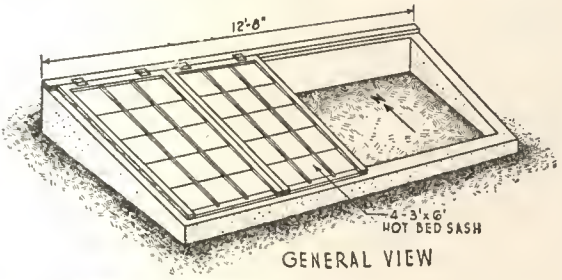
When it is necessary to drill holes in concrete floors and walls that contain buried electric conduit or other raceways, this signal will sound a warning the moment the chisel touches them. As all electric conduits are generally continuous and grounded, all you have to do is connect one side of the signal circuit to an exposed conduit and the other side to the chisel. Also, as most structural steel is riveted or welded into one continuous piece, the same idea can be used when drilling concrete that contains steel beams. The signal consists of two or three dry cells and a doorbell assembled and wired as shown in the illustration.



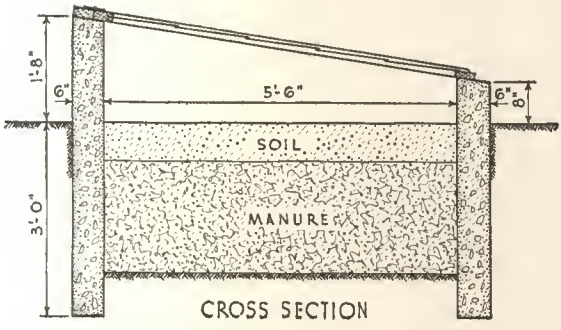
**Hotbeds and cold frames**—An easy way to extend the season of the home garden is to build a concrete hotbed or cold frame. Advancing early spring plants is another use. Cold frames and hotbeds are much the same except that the walls of the latter are usually carried deeper into the ground to form an inclosure for a filling of manure.

The location of beds should be such that full exposure to the sun is obtained. Protection from cold winds is desirable. A location on the south side of a building is ideal provided water from the eaves does not drip on the beds. Plans for a simple hotbed are given above.

Hotbeds and cold frames built of concrete are rotproof and permanent




GENERAL VIEW




CROSS SECTION

Pits for hotbeds are usually dug from 10 in. to 3 ft. deep. The length is made some multiple of 3 ft. as this is the width of standard hotbed sash. The width of the bed is also made to accommodate standard sash. On small beds, old window or storm sash may be utilized provided the bed is made of dimensions to suit.

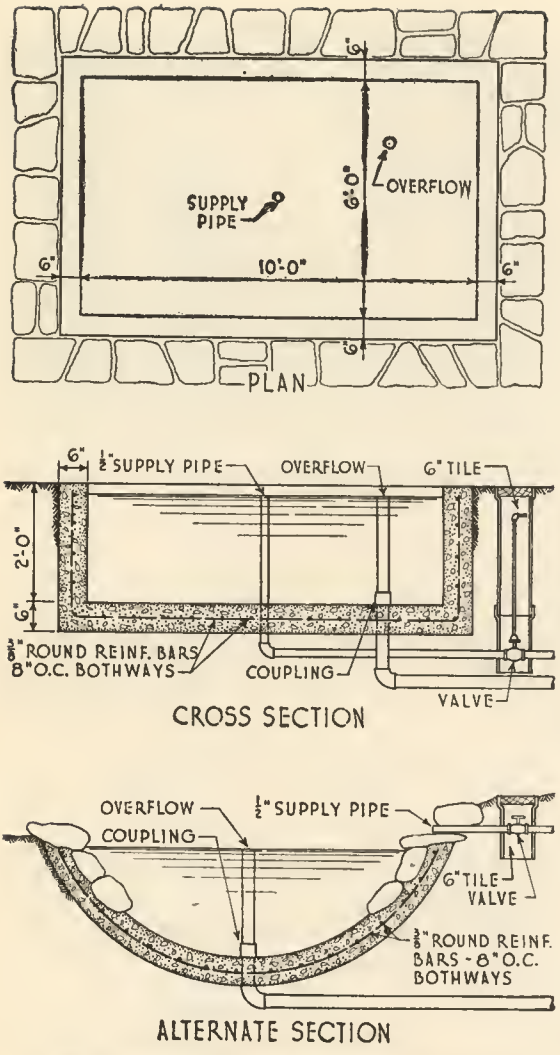
For a 4-sash frame the excavation should be laid out 6 ft. 6 in. in width by 12 ft. 9 in. in length. The latter dimension allows for necessary sash supports or bars which run across the bed. These are made of 1-in. dressed lumber and resemble an inverted "T" when in place. Walls of the bed are made 6 in. thick.

The bed is usually constructed so that the top of the south wall is about 6 in. and the north wall 12 to 18 in. above grade. This gives a slope from 6 to 12 in. As it is difficult to dig a 6-in. trench for concrete walls it is customary to make the excavation for the bed first, utilizing the earth for the outer forms up to ground level and using 1-in. boards above grade and for the inner forms. Recesses may be cast in the top surfaces of the wall to receive sash.

When the concrete has hardened, hotbeds are banked with earth and the embankment is sometimes covered with straw or manure to prevent loss of heat.

Cold frames differ from hotbeds in that no manure is used to supply the heat. Soil for cold frames should be of sandy nature as it responds more quickly to fertilizer, is usually better drained than heavy soil, and plants are not so apt to be injured by excessive watering.

Drainage, both surface and underground, is essential and the ground should therefore slope away from the site of the bed. Without ample drainage, water may collect in the pit and delay the growth of the plants and seriously check the fermenting of the manure. A tile drain about 4 in. in diameter is often placed so that the bed will drain should water collect.



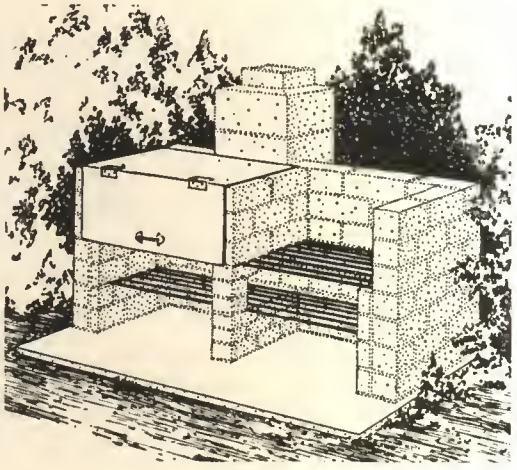

**Plans and construction details of garden pools**

**Lawn and Garden Pools**—Excavation to the desired form and depth is the first step in construction. If the soil is firm no outside form will be needed. When the soil is loose and crumbly both inner and outer forms will be required. The pool should rest on well compacted ground. Forms for the curved ends of the pool are made of 20-gauge galvanized iron. Since the pool must resist exterior soil pressure and in the winter, interior ice pressure, reinforcement must be used and placed as shown. It is necessary that concrete for the floor and walls be placed in one operation so that there will be no construction joints and therefore less possibility of leakage. Be sure to oil the inside faces of the forms. Deposit only 6 to 8 in. of concrete at a time in the wall forms and see that it is well tamped and spaded. A realistic rock pool may be constructed by making an irregular excavation with a bowl-shaped bottom. If the concrete is made in accordance with the recommended mixture given on page 2 and the sides are not steeper than a rise of 1 ft. in 2 ft., no forms will be needed. Natural rock may be set in the concrete before it has hardened.

When water is first placed in new pools it is likely to be strongly alkaline and may result in the fish being killed. Water in the pool should be changed at weekly intervals until pink litmus paper remains pink when placed in the water.

**Concrete masonry fireplaces**—Many people have found it desirable and economical to build fireplaces of concrete masonry units. Mortar for laying up these units should be carefully mixed, using 1 sack portland cement, 20 lbs. hydrated lime and 4½ cu. ft. mortar sand. Mix these materials together dry in a mortar box. Then add water and again mix thoroughly to obtain desired plasticity. Concrete mixture for base of the fireplace is given in the table on page 2.

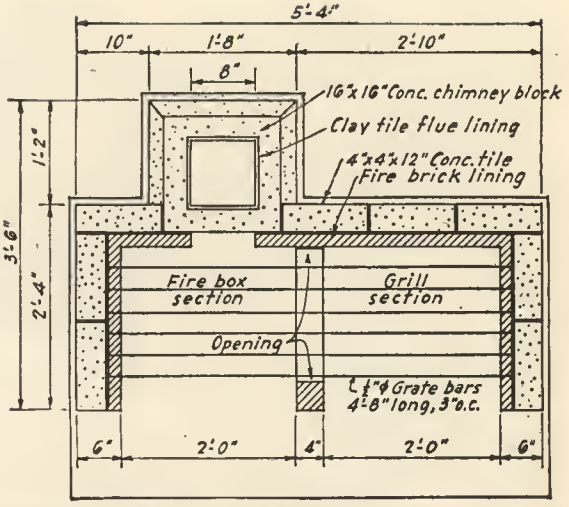
Fireplaces similar to those built of concrete masonry may be erected with concrete placed in forms. The mix used here is the same as that for the base of masonry fireplaces.



Most fireplace designs include a fire-brick lining. In small barbecue pits, however, a fire-brick lining is not absolutely necessary. Two properties of good concrete—durability and fire resistance—eliminate any need for fire-brick lining in small fireplaces.

In northern climates, where several feet of frost is not unusual, it is best to have a foundation reaching below the frost line.

Do not be too impatient to try out the new fireplace. A fire built too soon after the oven is completed will dry out the concrete mortar, possibly causing cracks. Cure the concrete properly. Keep it damp for 2 weeks by covering with wet burlap or sprinkling.




**Construction details of concrete masonry barbecue pit or stove**

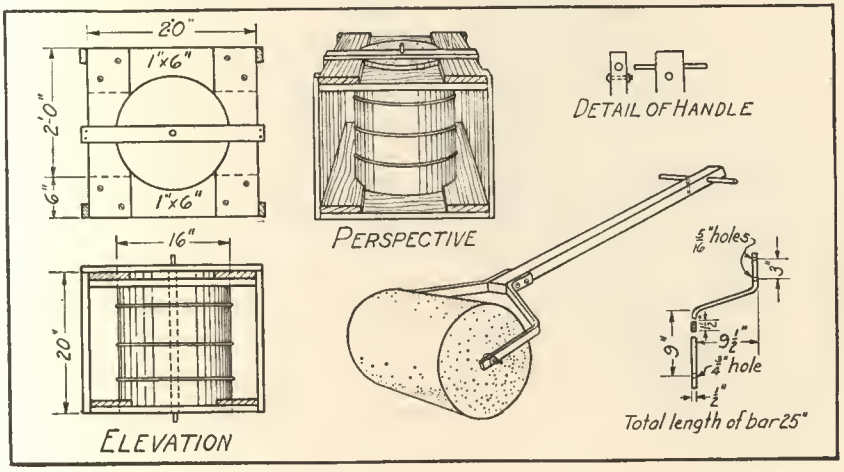
Select the oven, steel plates or grills, after the fireplace is completed. These fixtures can then be cut to correct size.

**Lawn roller**—Plans for making a practical, long-lasting concrete lawn roller are shown below. The forms are assembled as indicated, fitting the clamps around the galvanized iron sheet which is bent to circular form with its ends overlapping. If necessary the metal may be tacked to the clamps. An iron pipe is set in the exact center of the form, using wood strips with accurately bored holes to fit the pipe at top and bottom. Oil all surfaces with which the concrete will come in contact to make removal of forms easy.

Place the concrete in the forms spading it well and smooth off the top with a trowel. Metal form may be taken off after about 48 hours and any holes in the surface filled with 1:2 portland cement-sand mortar. Allow roller to cure for at least 10 days, wetting thoroughly every day. After it has cured thoroughly, the roller may be assembled as in drawing. A handle such as shown in the drawing can be made with pipe and fittings as shown.

**Tree surgery**—Many a fine old tree whose heart is being eaten out by decay can be given a new lease on life by the intelligent use of a little concrete. Tree cavities gradually increase in size until through lack of nourishment the tree starves, weakens and eventually dies.

The cavity should first be thoroughly cleaned, the dead and decayed parts cut out regardless of the size of the wound which is made. Because fungus growths



A garbage and ash receptacle

left in the tree under the concrete may cause decay to continue, the interior surface should be treated with creosote, crude petroleum or some other solution which prevents growth of fungus.

Care must be taken not to bring the creosote in contact with the cambium or growing layer which is under the inner bark, as creosote will kill the growing cells with which it comes in contact. Therefore, keep the creosote about an inch away from the cambium. A good plan is to paint the sap wood, cambium and edges of the bark along the cavity with shellac to keep them from drying.

Following this a thick coating of hot tar should be applied over the creosote to act as an expansion joint. Then slight movement of the tree will be less likely to cause the concrete to crack. If the cavity is 6 in. or more across the concrete should be reinforced. This may be accomplished by using pieces of heavy wire or ¼-in. rods extending from side to side of the opening.

One important point in filling the cavity should be noted: the concrete filling should be brought out just to, or better stated, just below the growing layer, so that the new cells can readily grow over it.

For shallow cavities a dry mortar of 3 parts sand and 1 part portland cement should be used. Mortar should be so stiff that it forms a lump when squeezed in the hand.

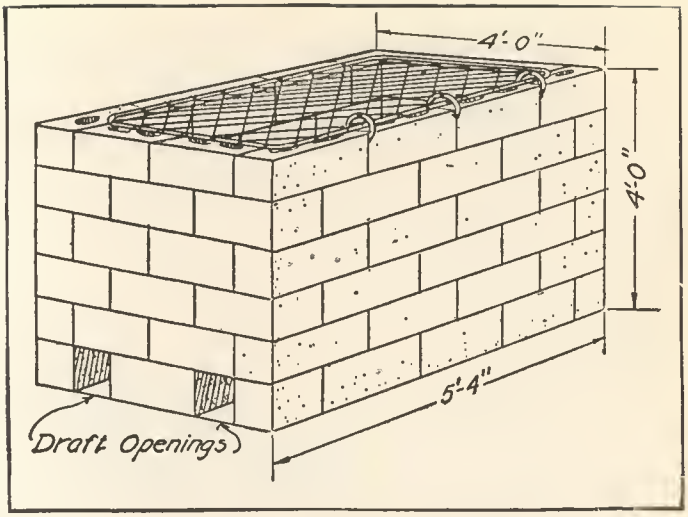
Shallow cavities should be filled in 6-in. sections as follows: Hold a board up against the lower 6 in. of the cavity with one hand, and with the other fill the cavity with mortar as high as the top of the board. Tamp the mortar down thoroughly filling every crevice. When the 6-in. section is completely filled with mortar, smooth and level top of section. Then cut a tar paper divider and place it on top of the section. Divider should be cut shallower than opening so that front edge does not show on face of completed section. Now slide form board up, fill and tamp a second section. Then scrape off loose mortar from lower section and give it a smooth surface with a trowel. The face of the concrete patch should be rounded slightly to conform to shape of the tree. Repeat process to fill cavity.

A deep cavity can be backfilled to within 4 to 6 in. of the front or opening, with a dry mix of either 1 sack portland cement to 5 cu. ft. bank-run gravel or 1 sack cement to 4 cu. ft. sand and 4 cu. ft. gravel. Backfill can be either a solid fill or section. Tack a piece of tar paper down the face of the backfill, then fill the face of the cavity with the portland cement-sand mortar in sections as explained.

Completed sections of the concrete filling should be kept moist for about 10 days for proper curing of the concrete. The bark and sap wood will eventually grow over the edges of the concrete filling. If proper care has been taken in preparing the cavity, placing and curing the concrete, decay will be checked and the life of the tree preserved.

**Supporting bolts in wet concrete**—When it is necessary to anchor a bolt in freshly poured concrete, one contractor, supports it in position with a piece of screen wire. First, the bolt is placed in the concrete in the desired position, then the wire is slipped down over the threaded end and the nut is started. In this way, the wire serves as a float to keep the bolt in a vertical position until the concrete sets.

**Ash receptacle and refuse burner** — Design for making an inexpensive concrete masonry refuse burner is shown at right. An excavation is made 6 in. deep upon which the base is laid. The base form is then assembled and set in place. The recomended proportions for this work are shown in the table on page 2. Place the concrete in the form, tamping it thoroughly. Level off the surface by means of a strikeboard resting on the edges of the form. Allow the base to harden 24 hours before removing the base.

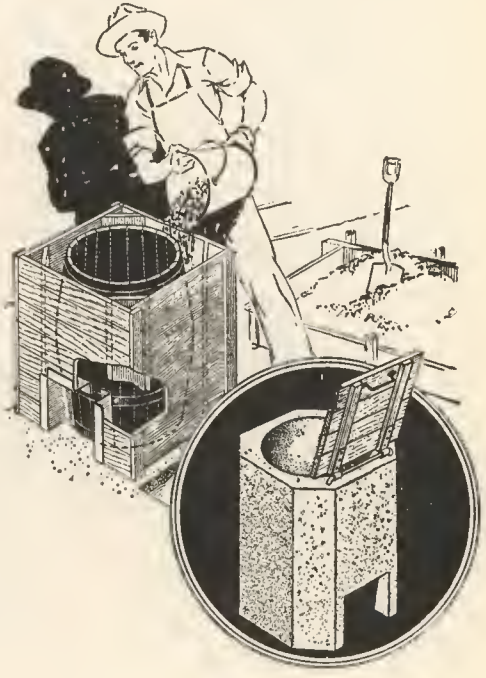



Design for a simple concrete masonry refuse burner

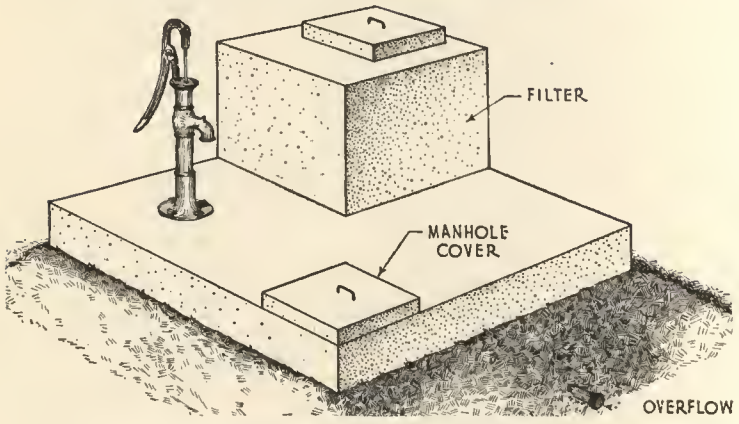
Concrete block used for the walls may be secured from a local dealer. A 1:1:6 mortar (1 part portland cement, 1 part lime and 6 parts sand, all measured by volume) is recommended for laying up the units. The bottom course of masonry is laid with half units at the corners, leaving draft holes at each end as indicated. The succeeding courses of units are placed spreading a bed of mortar ½ in. thick on each preceding course. Each unit as laid is "buttered" on the ends to make well filled vertical joints. Allow the mortar to harden for 2 weeks before using the burner.

**Bed springs reinforce concrete** — When the amateur mason contemplates a slab, pool, or base of concrete he logically thinks of reinforcing it with poultry netting or odd pieces of scrap iron. Neither is satisfactory, the netting because it lacks strength, and the iron because it does not tie together the whole mass. Old flat bedsprings of the individual coil, woven, or metal-strip type are one of the best substitutes for regular bars or grids. If not found on a dump the spring can be picked up cheaply at secondhand shops. For thin slabs the frame should be removed. In making a tank the spring or springs should be arranged so that part will be in the bottom and remainder bent up into sidewall forms. This ties the bottom to the sides. If the area is large enough to require more than one spring they should be overlapped slightly.

**Garbage-container forms made from barrel and packing box**—By using an ordinary barrel and a packing box for forms, you can make a concrete garbage container with little labor. There should be a 2-in. clearance between the box and the largest diameter of the barrel when both are set in position. Boards placed diagonally across each corner of the box will give the effect shown in the circular inset. The scoop hole at the bottom is made by inserting a piece of sheet metal in a hole cut in the box. After the concrete has set, the barrel can be removed by tearing the staves apart with a prybar.



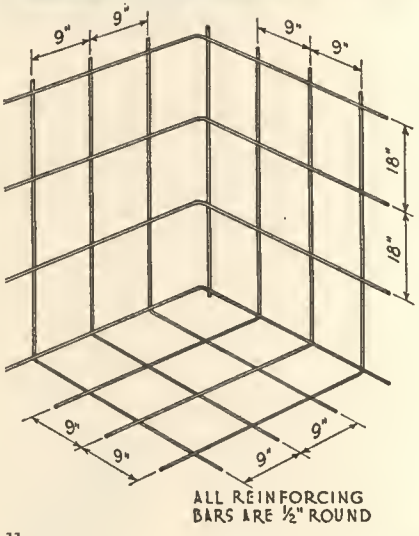
# Permanent Farm Construction



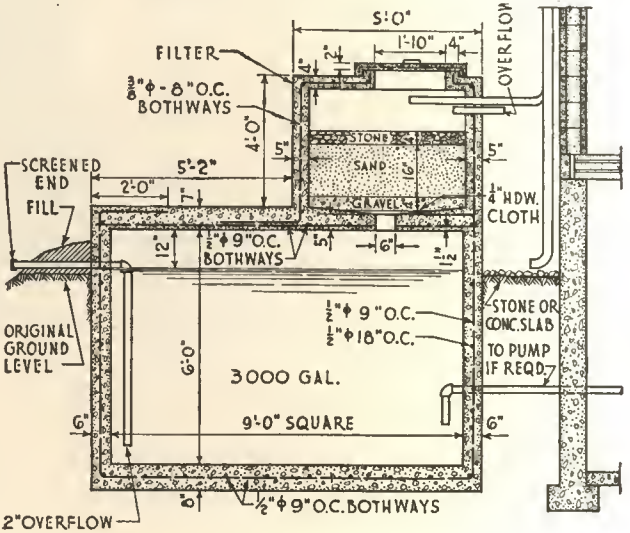

**Concrete cisterns** — An ample supply of clean, soft water for the home is a convenience appreciated by every farm family. Plans for a family-size concrete cistern are shown on this page.

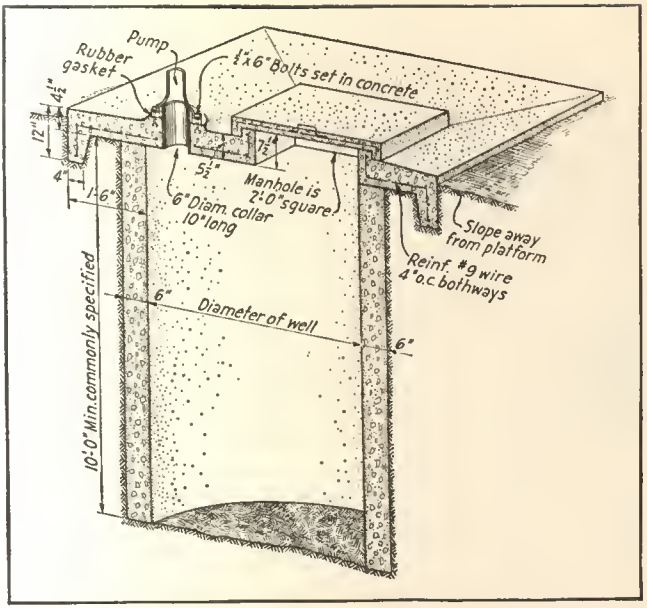
Suggestions concerning construction and care of cisterns are intended principally for cisterns holding rain water supplies for household purposes other than drinking. The cistern shown, however, is equally suitable for storage of drinking water in areas where safe and ample supplies of well water cannot be secured. A drilled well or a dug well, however, can be more securely protected against contamination than can a cistern. Wells should, therefore, be used for the drinking water supply whenever possible.

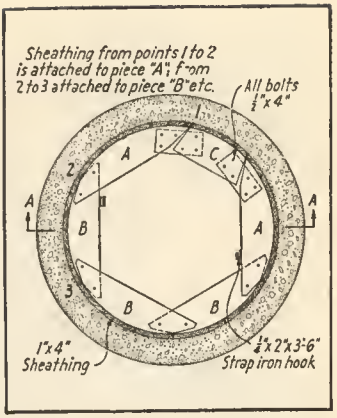
High quality concrete and first-class workmanship are essential in cistern construction to assure that the finished structure will be watertight. Watertight concrete is obtained with the 1:2¼:3 mix. Proper reinforcement of the cistern is shown in the plans. Reinforcing bars should be placed as shown and securely wired together. Ends of bars should extend past each other 2 feet at laps.




A filter to remove sediment from rain water is usually desirable. The filter can be built on top of the cistern as shown in the drawing or it can be built separately with a connection to carry the clean water to the cistern. The type of filter shown has proved practical and in every way satisfactory provided it is given occasional cleaning. Some debris, such as sticks, leaves, cinders, etc., will be carried into the filter with the rain water. This unwanted material must be removed from the filter from time to time by removing the top layer of stones and






**Reusable forms for circular wells.**

**Left, cross section of concrete well platform and curb for dug wells**

sand and replacing with similar clean materials.

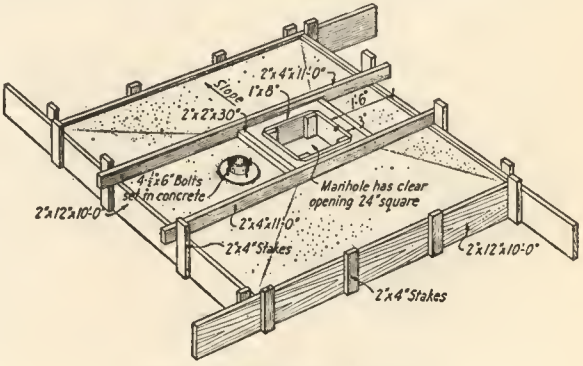
Cistern water should never be considered entirely safe for drinking unless it is first chemically sterilized or boiled. The first time water is placed in a new concrete cistern it may become quite hard. This hardening effect can be considerably reduced by letting the new concrete cure or harden thoroughly before the cistern is filled. If the first filling becomes undesirably hard despite this precaution, the water may be softened as follows: Dissolve 2 lb. of baking soda in 1 or 2 gal. of water, then thoroughly mix this solution into the cistern water.

**Well curbs and platforms**—A concrete well curb and platform are recommended by health authorities as a permanent means of insuring spring and well water supplies against contamination. The concrete curb extends high enough to prevent surface water from entering and deep enough to exclude seepage and burrowing animals. The concrete platform or covering completes the protection.

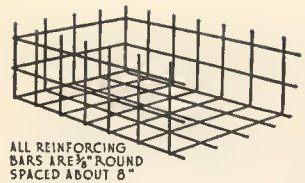
The earth wall of the well is generally sufficient for the outer forms, but if not, the excavation will have to be enlarged to provide room for setting wood forms. A convenient collapsible interior form, made of 1-in. material, is shown in the accompanying drawing. It is made in four sections, the crosspieces being held together by bolts which are removed when the form is taken down. The sheathing boards should not be more than 4 in. wide. Apply oil to form faces next to concrete to make removal easy. For the small well a curb 4 in. thick is sufficient, but for wells 3 ft. or more across, 6 in. is recommended.

For wells and spring enclosures 6 ft. or less in diameter a platform 4 in. thick at the edges is adequate. Quarter or ⅜-in. reinforcing rods should be placed 6 in. apart in both directions and located about 1 in. above the lower surface of the concrete. The platform should extend well over the edges of the well curb. It should be at least 1 in. higher at the center to insure drainage.

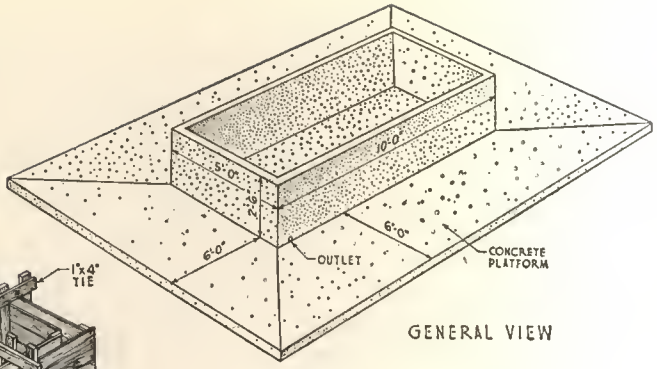
A tight board platform braced in position from below or suspended by wires or brackets to the previously placed curb will serve as a bottom form for the cover. Be-



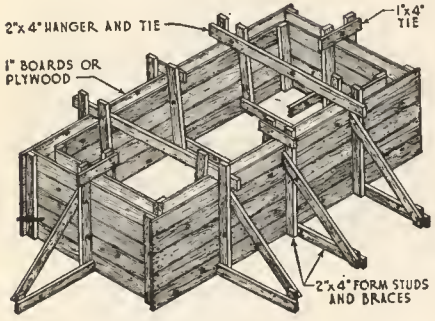

**Forms for precasting well platform**



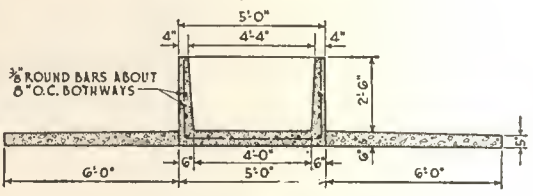

REINFORCEMENT DETAIL




GENERAL VIEW




GENERAL VIEW OF FORMS




CROSS SECTION

fore placing concrete, provide for an 18-in. manhole, also an opening for the pump stock. Bolts may be set in the concrete for attachment to pump base. A cross-sectional view showing construction of the cover slab and the manhole is shown. The removable cover for the manhole is made separately. Another method of providing a manhole is to set a large dishpan on the platform form, the concrete being placed around it and sloped upward slightly against the pan. Removal of the pan will provide an opening with sloping edges in the concrete. A tight fitting cover can be made by casting it in the pan.

The concrete mixture recommended is given in the table, page 2. As the concrete is placed it should be tamped and spaded. Any rough spots found on removal of the forms are patched with a 1:2 concrete mortar. Finish the platform with a wood float to a smooth, yet gritty surface.

**Stock watering tanks**—Concrete stock watering tanks properly built are watertight and concrete will not rot or rust. Suggested construction of a rectangular stock tank is shown above. As in the case of concrete cisterns, it is important to use high quality concrete and good workmanship in order to obtain a watertight tank.

Steps in construction are relatively simple. Reinforcing bars should be bent and wired securely in position as indicated in the plan. Outside and inside forms are built next, then the concrete floor of the tank is placed. Care should be taken to keep the reinforcement in position in the center of the floor as concrete is placed.

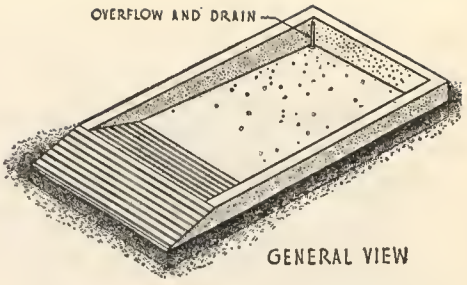
Concreting should be continuous walls of the tank being placed immediately following the floor. In this way the possibility of a leaky construction joint is avoided. Concrete should be spaded thoroughly next to the form faces to produce dense, smooth surfaces.

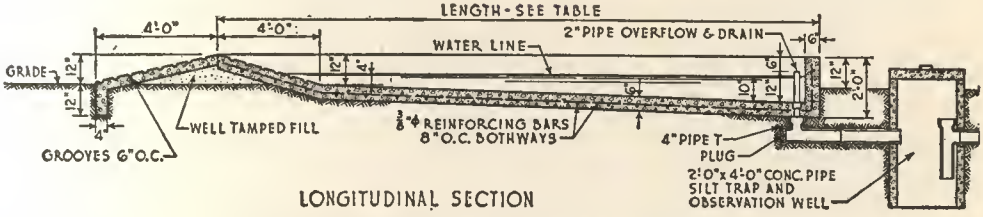
After concrete hardens for 2 or 3 days, forms may be removed. Any stony spots found are patched immediately with a cement-sand mortar consisting of 1 volume portland cement to 2½ volumes sand with just enough water to make a plastic mortar. The mortar should be worked into the rough spots with a wood float, then left to harden. After the mortar has become quite stiff, it may be troweled firmly but sparingly with a steel trowel to make a smooth, tight patch.

The new concrete tank should then be protected from drying out for at least 7 days by covering with burlap or other material and keeping it wet.

**Concrete hog wallow**—Hogs have very few sweat glands, thus they need an abundance of water and shade to keep cool in hot weather. With access to a clean concrete wallow, hogs gain faster and require less feed per 100 lb. of grain than where a wallow is not available.

The wallow should be located adjacent to the feed lot and for best results good shade should be provided nearby. Suggested construction of the wallow is shown below. Provision for clean-out should be made in some way as shown so that the wallow can be kept in a sanitary condition. A small piece of paving around the wallow helps in maintaining a clean condition and prevents undermining of the structure.




**Construction details of sanitary concrete hog wallow**

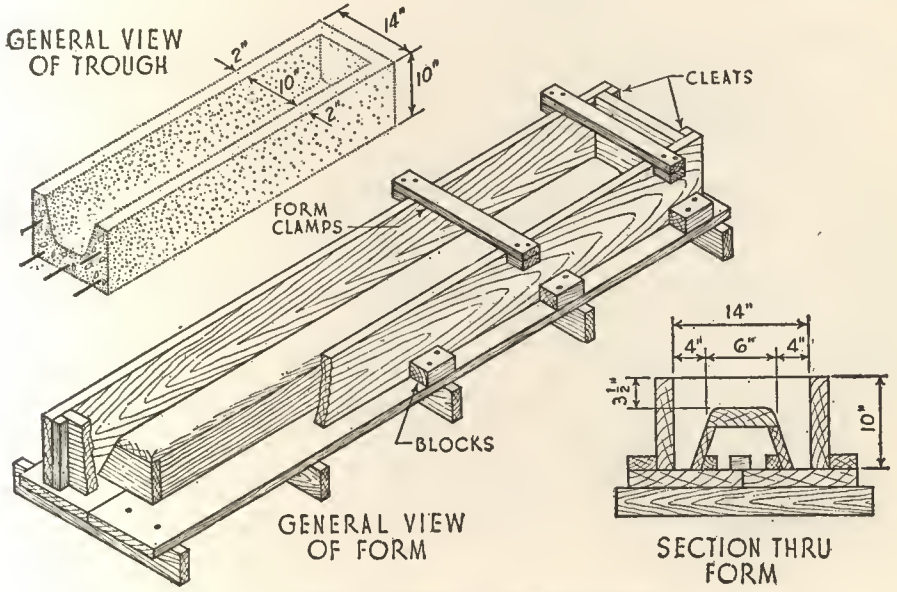
**Hog trough and automatic waterer**—Concrete hog troughs last indefinitely, they are easy to keep clean and cannot be tipped or moved about by the hogs. Construction is relatively simple.

It is suggested that the 1:2¼:2½ concrete mix with ¾-in. maximum size gravel be used. As concrete is being placed, it should be spaded and tamped moderately to assure smooth concrete surfaces.

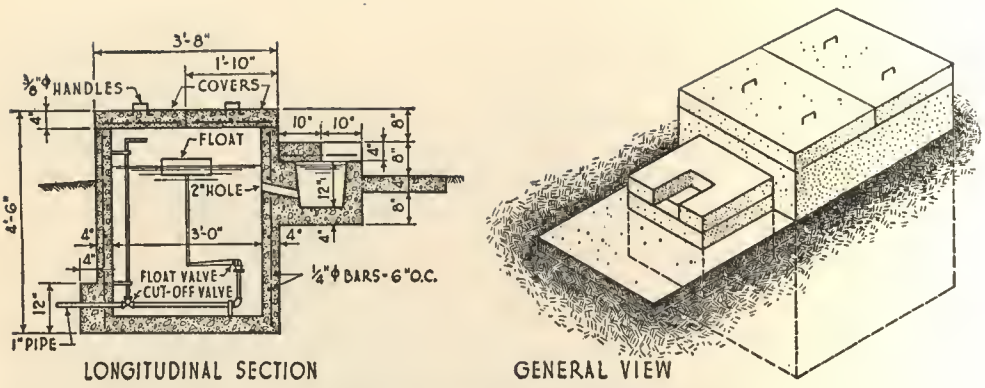
Plans for an automatic concrete waterer for hogs are shown on page 50. Where running water is available the automatic waterer greatly reduces work of caring for the herd and hogs make faster and cheaper gains if they have access to an ample supply of water.

**Milk cooling tanks**—An insulated milk cooling tank is usually employed where milk regulations specify that milk be cooled rapidly to 50 deg. F. or lower.

Suggested construction of the insulated cooling tank is illustrated on page 50. Forms are built in much the same way as those for stock watering tanks shown on page 48. Construction is as follows: The




**Form details for building concrete hog trough**



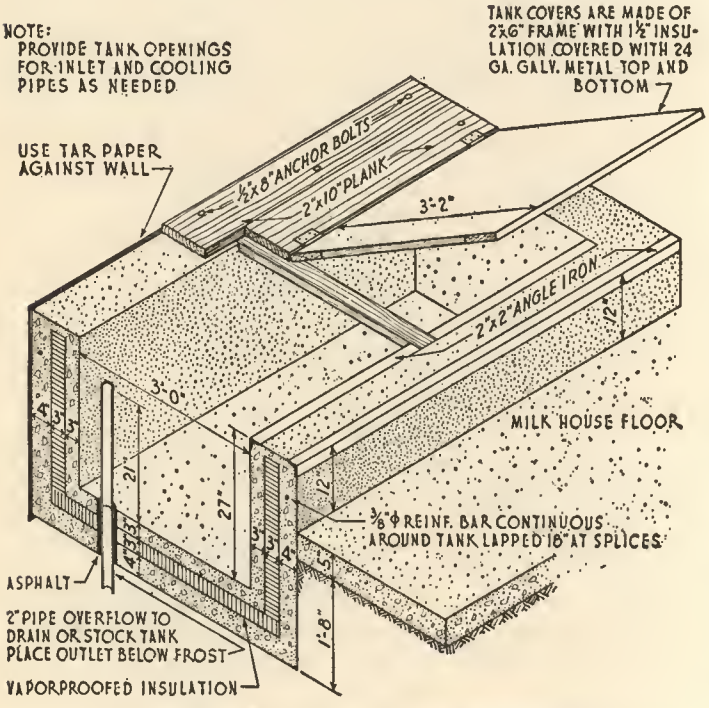

**Plans for an automatic concrete waterer for hogs**

concrete base slab 4 in. thick is placed, then tank forms and insulation are installed, The overflow pipe and other pipes are placed before concreting begins. In northern areas, drain pipes should be laid below frost level. Only high quality insulation board 3 in. thick put up in vaporproofed packages should be used. When necessary to cut a package, exposed edges should be dipped repeatedly in hot asphalt to secure a thoroughly waterproof seal. Every precaution must be taken to keep insulation dry.

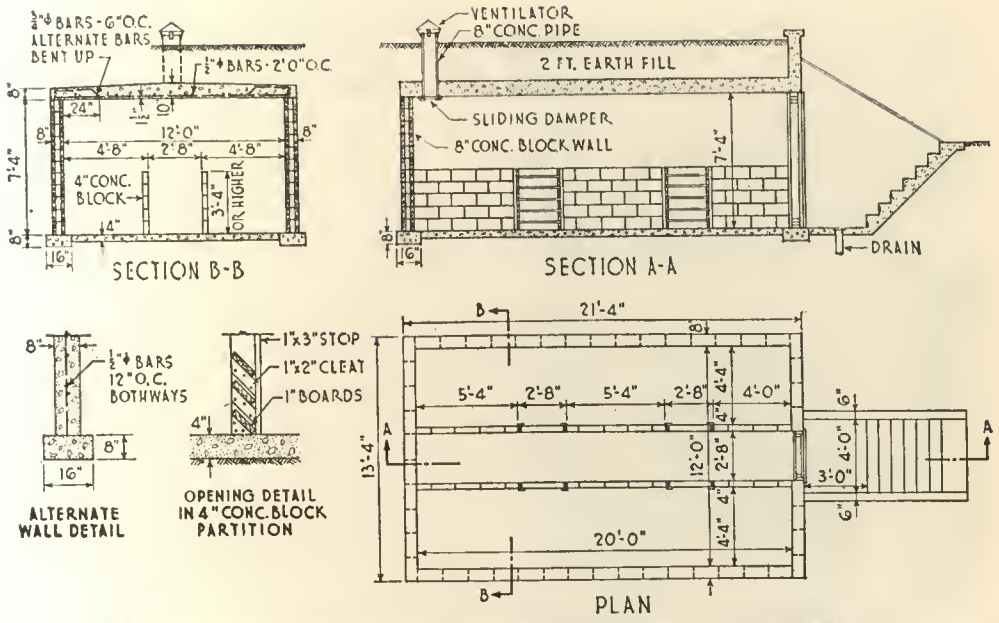
When wall forms have been filled with concrete, anchor bolts for attaching the rim planks and the 2x2 angle irons are set. Forms may be removed after concrete hardens for 24 to 48 hours. The new concrete should then be moist cured for at least 10 days.

**Small storage cellar**—A small underground storage cellar or cave is one of the most practical solutions to the problem of economical and satisfactory storage of fruit and vegetables on the farm. Underground storage cellars maintain cool temperatures and relatively high humidity, tending to keep produce in good condition over a considerable period of time. Thus, a variety of home-grown fruit and vegetables may be had through the year.

Plans for a small underground storage are shown on page 51. Walls of the small storage may be of either concrete masonry units or of reinforced concrete. Storages of larger size should generally be of reinforced concrete construction. Construction of footings and walls is similar to that described under "Foundations, walls, footings," pages 56 to 59. The reinforced concrete roof of the storage is supported during construction on temporary wood forms. The sheathing boards should be sup-




**Suggested construction of insuloted milk cooling tanks**



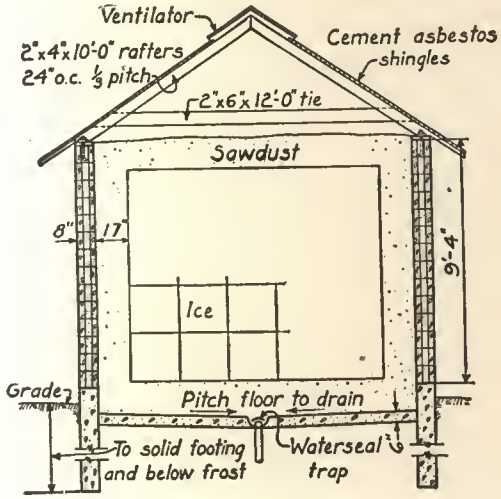

**Plans and construction details of a small underground storage for fruit and vegetables**

ported on 2x6 form joists, spaced 2 ft. on centers, the 2x6's in turn being supported 4x4's or larger beams placed about 4 ft. on centers. The beams are supported at about 6-ft. intervals by a 4x4 or larger post properly braced and wedged in position.

For greatest convenience, the storage cellar should be built into a side hill. This simplifies construction of the entrance and reduces labor in filling and emptying the storage. However, if the cellar must be located where the ground is nearly level, construction may be as shown in the plans.

**Icehouses** — Government investigations have shown that a large share of all dairy products are a loss before they leave the farm, due to absence of or inadequate cooling facilities. Proper cooling by use of ice greatly reduces this waste, and ice can often be had for the cost of harvesting during the season when farm labor has least to do.

Monolithic concrete and concrete block are both ideal materials for icehouse construction. They are not only economical in first cost, but result in permanent structures which require very little or no maintenance. Icehouses are always damp and concrete is not susceptible to rot or other forms of depreciation. Fire is seldom thought of in connection with an icehouse, yet spontaneous combustion frequently occurs due to heat generated by changing conditions of moisture in the materials. Concrete icehouses give a full measure of fire protection.




CAPACITY OF ICEHOUSES

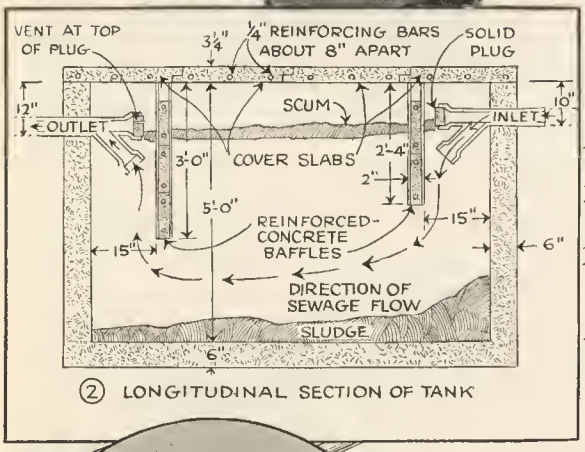
| Height in Feet | Width in Feet | Length in Feet | Capacity in Tons |
|---|---|---|---|
| 10 | 12 | 12 | 18 |
| 10 | 12 | 16 | 25 |
| 10 | 14 | 16 | 30 |
| 12 | 12 | 18 | 35 |
| 12 | 14 | 18 | 43 |
| 12 | 16 | 18 | 50 |
| 12 | 16 | 22 | 62 |
| 12 | 18 | 22 | 71 |
| 14 | 16 | 24 | 82 |
| 14 | 18 | 24 | 94 |
| 14 | 20 | 24 | 105 |

# *Rural* SEWAGE DISPOSAL

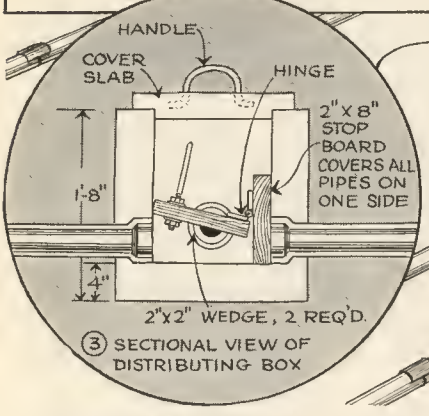
①

PROPER disposal of sewage and waste matter is just as essential to the summer home or farm as it is in the city. By the use of a simple septic tank and proper disposal of the effluent or outflow from the tank, the possibility of pollution of the water supply can be practically eliminated.

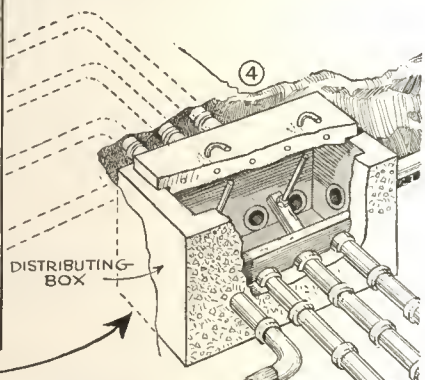
The septic tank should be reasonably close to the house, say 5 to 20 ft., depending on conditions, so that sewer lines can be short and straight. In this way it is unnecessary to interpose a grease trap between the kitchen and the septic tank. It should not be located in close proximity to wells, springs or cisterns. A distance of at least 50 ft. is advised. Any gases formed in the septic tank will escape through the vents in the plumbing system of the house. It is required that all plumbing outlets be equipped with vents above the house level.




② LONGITUDINAL SECTION OF TANK




③ SECTIONAL VIEW OF DISTRIBUTING BOX



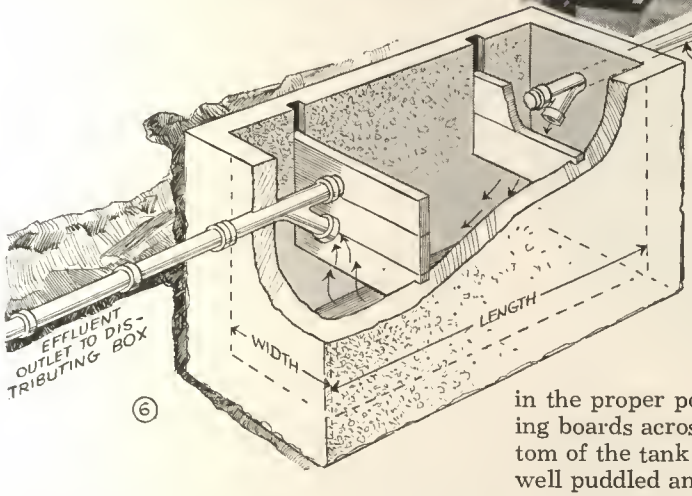

SIZE FOR SEPTIC TANK

| No. of Persons | Inside Dimensions in Feet | | | Gallons Capacity |
|---|---|---|---|---|
| | Length | Width | Depth | |
| 7 or less | 6 | 3 | 5 | 540 |
| 8 to 10 | 7 | 3 | 5 | 630 |
| 11 to 14 | 8 | 3 | 5 | 720 |
| 15 to 21 | 9 | 4 | 5 | 1080 |
| 22 to 24 | 10 | 4 | 5 | 1200 |

*Two "purifying fields" located on oppasite sides of o distributing box, permit one ta be rested while the other is in use. Thus over-irrigotion of the soil is ovoided. Use of a stop boord ar valve in the distributing box mokes it eosy to direct the sewage to either field*

# MADE SAFE

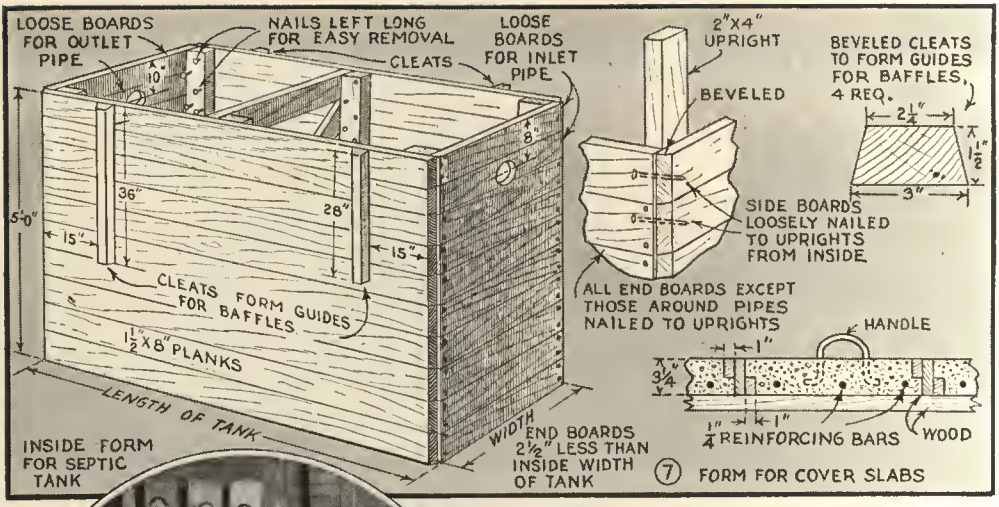
These are the usual restrictions imposed by health ordinances and by good practice in plumbing. On the assumption that the plumbing in the house will be adequate, there is no need for any further concern on this score. The tank must be built large enough if it is to be safe, and this means that a capacity of not less than 50 gals. per person must be provided. In addition, no tank should be built smaller than 500 gals. or thereabouts, as very small tanks are found to be inefficient and have no overload capacity. It is best to build a tank larger than present needs, to provide for future or unexpected requirements. You can purchase a ready-made metal tank,

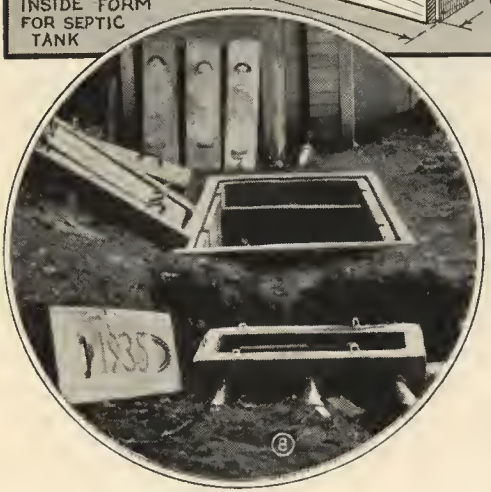




coated to make it resistant to corrosion, or you can build a concrete tank. In case of a concrete tank it should be cast in one piece as shown in Fig. 6, so that there are no construction joints in sides or bottom. Construction details are given in Figs. 2, 3, 4 and 5. The size of the required tank can be found from the table in Fig. 4. Fig. 2 indicates the appearance of the tank in operation.

Beginning construction, the first consideration is the forms. If the ground is firm and does not cave, no outside forms will be required and the excavation, Fig. 1, should be made the exact outside dimensions of the tank. If the soil caves, outside forms will be required, and the excavation must be made large enough to accommodate these. Inside forms should be constructed as shown in Fig. 7. Note the cleats on the outside of this form to provide channels for the baffles, Figs. 2 and 6, and note also the provision that is made for inlet and outlet pipes.

It will be necessary to suspend the inside forms in the proper position by nailing supporting boards across the top, Fig. 5. The bottom of the tank is then poured first, and is well puddled and tamped for solidity. The concrete should be mixed 4¼ gals. of water per sack of cement, if moist aggregates are used. With dry sand and aggregate, this quantity of water can be increased somewhat, but no more than 5½ gals. of water should be used under any circumstances. If the sand and aggregate are very wet, reduce the amount of water to 3¾ gals. per sack of cement. About 2 cu. ft. of sand and 3 cu. ft. of gravel or crushed rock, graded up to 1 in., should be used to each sack of cement. This amount of aggregate should be tried in the first batch and adjusted if necessary by using more or less aggregate in succeeding batches. Do not vary the amount of mixing water. The concrete should be mixed thoroughly until each particle of gravel is covered with a mortar of sand and cement. The final mix




should place readily, but require some tamping to settle properly. Avoid mixes that are too sloppy or too dry.

As soon as the floor is poured, start pouring the walls. Pour about 6 to 8 in. at a time, puddling and tamping well until thoroughly compacted, and then pour the next layer. Continue in this manner until the forms are filled. The inlet and outlet pipes are cast in place. In summer the forms can be removed after about a day, but if the weather is cold it will be better to wait somewhat longer. It is not well to leave the forms too long, as they may swell, making removal difficult.

The cover slabs and the baffles are cast in molds as in Figs. 7, 8 and 9. They should be made in sections light enough to be handled easily when necessary. About 1 in. of concrete is poured in the molds, the reinforcing rods or bars are then put in place, and the form is filled. Handles should be provided in the lids.

The line connecting the septic tank to the house should be constructed of 4-in. bell-and-spigot tile pipe. The joints must be cemented tightly so that there will be no danger of seepage. The straight end of the inlet pipe, Fig. 2, should be plugged so that all sewage will enter below the surface of the liquid. The plug can be removed should it be necessary to clean out the sewer pipe.

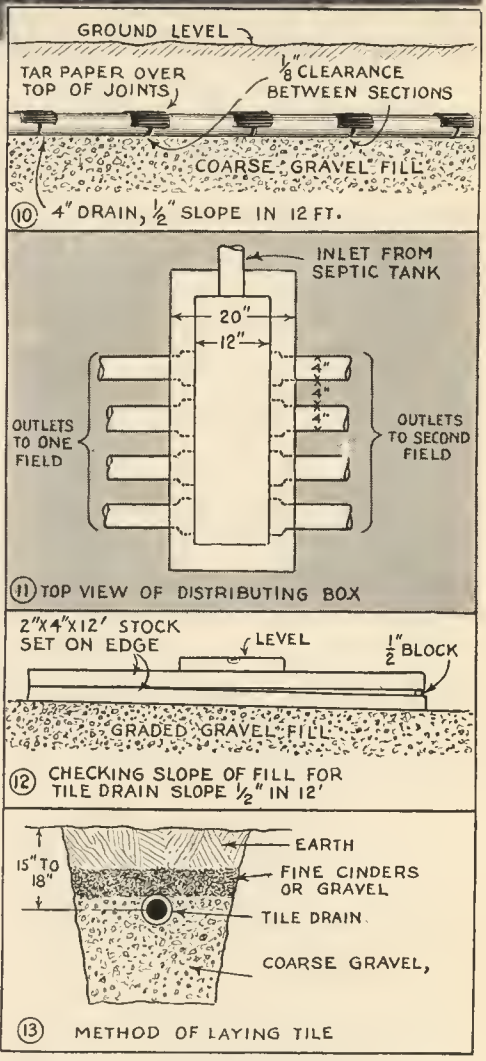
The liquid, or effluent, which leaves the septic tank is not purified completely. The action of the septic tank is carried on by a species of bacteria called "anaerobic," which means that they thrive in the absence of air. These bacteria liquefy the solids in the sewage and the effluent is relatively clear and partly purified. It is then fed underneath a purifying field where the process of purification is completed. In this case the action is carried on by bacteria that are called "aerobic," that is, those that require oxygen for living. The organic matter in the sewage is fully oxidized here and all harmful substances are eliminated completely.

The effluent is carried to a distributing box, Figs. 3, 4 and 11, by means of a sealed tile pipe. From this distributing box, a number of open-jointed tile pipes are run underneath the purifying field. The length of open tile that will be required will depend on the quantity of sewage and also on the nature of the soil. If the latter is light and porous, or sandy, as little as 30 ft. of drains per person will serve. On the other hand, a clay soil may require as much as 100 ft. of pipe for each person. Another necessary precaution is to provide dupli-

cate facilities so that one area can be allowed to rest while the other is being used. In this way you will avoid overworking the soil and especially over-irrigating, since the sewage is principally composed of water. If the distributing box is constructed as shown in Figs. 3 and 11, it is a very simple matter to divert the flow to either of two fields. A stop block in the box covers the tile openings to one field and is held by hinged wedges.

The drain tiles preferably should be laid in a substantially level field, about 15 to 18 in. underground—just deep enough to plow over. Dig trenches about 2 to 2½ ft. deep and fill them to the required depth with gravel or crushed rock, as shown in Figs. 10 and 13. This must be graded carefully to give a pitch of ½ in. in 12 ft. Two 12-ft., 2 by 4-in. planks, a ½-in. block, and a level will serve to check the slope, as shown in Fig. 12. The tile that is used for the system is ordinary open-jointed drain tile. The tiles are laid on top of the gravel, with about ⅛ in. between succeeding sections, and a piece of tar paper is laid over the top of each joint, as shown in Figs. 4 and 10. Then gravel is placed loosely over the pipe, followed by a layer of fine cinders, and finally the topsoil is replaced.

The tank should be allowed to cure for about two weeks before being placed in use. After this, it will take a few days for the tank to fill and set up ideal operating conditions. In operation, a thick scum will form over the top of the liquid in the septic tank, as indicated in Fig. 2. As this is the best protection for the anaerobic bacteria, it should not be disturbed.



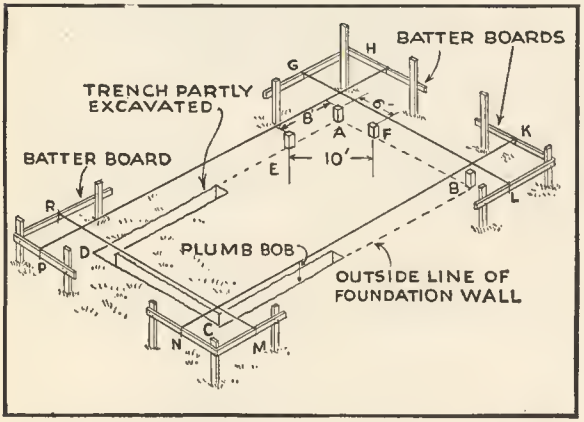

*Tile trenches in "purifying field" should be 24 to 30 in. deep and should be filled with coarse gravel or crushed rock as indicated above*

**Foundations, walls, footings**—A strong, durable foundation is the first requirement for every good building. Concrete foundations prolong the life of buildings because they insure uniform distribution of the weight on the soil, thereby preventing settlement and consequent cracking of walls and retaining the structure in first-class condition at minimum maintenance cost. Such foundations likewise are ratproof, fireproof and permanent.

Concrete foundations are also a barrier against termites which often destroy wooden structures. By keeping rats out of storage buildings, concrete foundations or basement walls in a short time will prevent waste or destruction of foods or other products equal to their cost.

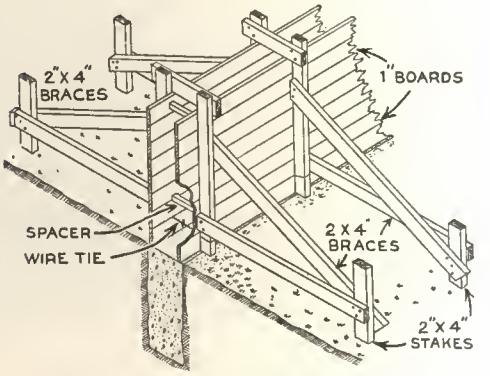
The easiest, quickest and most accurate way to determine the foundation lines of a new building is by means of surveying instruments. When such instruments are not available, one of the simplest methods for laying out corners, known as the right triangle method, can be used. A triangle with sides 6, 8 and 10 feet long is a right triangle and the 90-degree angle, or right angle, is opposite the longest side.

First, a base line is established, marking out one end or side of the new building. See line A-B in accompanying drawing.




**This method of laying aut foundations assures true walls**

Stakes are set at A and B on this line, locating two corners. In the top of Stake A a nail is driven near the center. This nail accurately locates the corner. On the line A-B another stake is driven at F, 6 feet from Stake A. A nail is driven in the top of this stake exactly 6 feet from the nail in Stake A. Stake E should be driven so that its center will be exactly 8 feet from Stake A and exactly 10 feet from Stake F. The corner represented by the angle E-A-F is a right angle; the line A-E extended to D will form the second boundary line of the building and D will represent the third corner. Other corners are located in a similar manner. After this has been done, strings are stretched over the corner stakes A-B-C-D and carried to outside supports called "batter boards" as indicated by G-H-K-L-M-N-P-R. The top of the horizontal batters should be set at first floor level or some convenient "datum." The building lines may be projected from the strings to the ground by means of a plumb bob suspended as shown in the drawing. When the outside Stakes G-H-K-L, etc., have been set and the strings indicating the layout of the building transferred to them, the corner Stakes A-B-C-D and Stakes E and F are removed so that the trench may be excavated. Nails should be driven in the batters where the strings are fastened so that if the strings are broken or removed, they can be replaced accurately. Having found the building lines, it is easy to locate piers, posts, columns or other intermediate supports.




**Forms for foundatian wall above grade**

For small structures without basements the earth wall of the foundation trench may serve as forms if the earth is of a type that does not cave readily. The trench should be excavated carefully with sides even and vertical and bottom leveled and properly widened to receive the footing. In caving soil it is necessary to construct forms to receive the concrete.

The forms should be rigid and well

braced in order to withstand the pressure of wet concrete and produce a straight, even wall without bulges or depressions. Wet concrete weighs around 150 pounds per cubic foot. Form sheathing, as well as posts and studs, must be strong enough to withstand pressure due to this weight. For walls not over 12 inches thick, 1-inch boards restrained at 24-inch intervals ordinarily will withstand pressure of concrete 3 feet deep without bulging. A 2-inch plank (nominal size) will be safe against bulging under this load with supports at 40-inch intervals. For deeper or thicker sections of walls, posts are placed closer or heavier form boards are used.

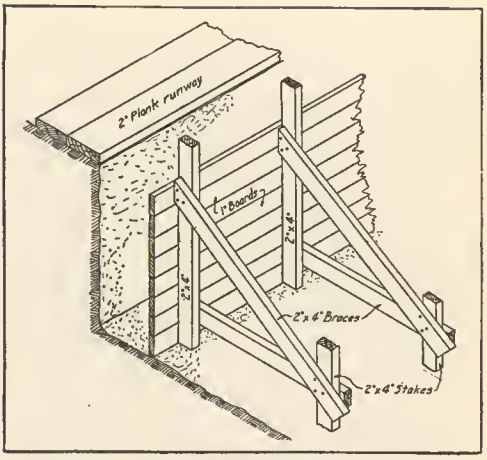
Posts or studs for supporting form boards or sheathing must hold forms in a true line; 2 by 4's or 2 by 6's are usually satisfactory for this purpose. These may be strengthened at intervals by wire ties run through the forms. For keeping inside form surfaces the proper distance apart, wood "spacers" or "spreaders" of a length equal to the desired wall thickness are placed between the forms before the wire ties are tightened. As forms are filled with concrete the spreaders are removed.

Forms should be constructed so that, if it is desired to use them again or to use the lumber for other work, they can be "knocked down" with least damage to the lumber. This often is accomplished by the use of screws or special double-headed nails instead of common wire nails for holding forms together. Stock lengths of lumber often can be utilized without cutting. In that case lumber needed for other portions of the building can be used first for form lumber.

To prevent concrete from sticking to forms, crude oil, soft-soap or whitewash should be painted on form faces next to the concrete. Oil drained from the automobile crankcase is satisfactory for this purpose. Surfaces are treated each time the forms are used.

It is common practice to place concrete footings for all types of foundation walls. Such footings provide an even surface on which to start the wall proper whether cast-in-place concrete or concrete masonry. Also they provide increased bearing area on the soil, preventing settlement.

**Computing footings**—In determining the width of footings, the character of the soil as well as the weight of the building and its contents must be taken into account. The




**Forms for foundation walls where the embankment serves as the outer form**

footing is made wide enough to spread the load over sufficient area to be safe against settlement. Load-bearing capacities of different soils vary. The following indicates safe loads for various soils:

Soft clay, 1 ton per sq. ft.; wet sand and firm clay, 2 tons per sq. ft.; fine and dry sand, 3 tons per sq. ft.; hard dry clay, 4 tons per sq. ft.; coarse sand, 4 tons per sq. ft.; gravel, 6 tons per sq. ft.

"Dead" load, as the weight of the building commonly is called, is computed by summarizing weights of various portions of the structure. A solid concrete wall 8 inches thick weighs about 100 pounds per square foot of wall area. Such a wall 10 feet high puts a "dead" load on the footing of 1,000 pounds per lineal foot. Concrete block walls 12 inches thick weigh about 80 pounds per square foot of wall area. Sixty pounds per square foot is the weight of an 8-inch wall made of concrete masonry. Lumber used in building construction commonly weighs from 2 to 4 pounds per board foot. Brick masonry averages 115 pounds per cubic foot. These weights, although approximate, are sufficiently accurate for figuring "dead" loads in order to compute the size of footing required.

Determination of "live" loads, those imposed upon the foundation by the contents of the building, largely is a matter of personal opinion based on experience. Building ordinances often specify minimum "live" loads allowable in the design of floors and in such cases these values are used in computing loads on the foundations. These loads vary according to the occupancy of

the building. Thus, 400 pounds per square foot of floor area may be the requirement in designing a warehouse for storing hides, while an ordinary dwelling is unlikely to be called upon to carry one-tenth that amount. Most building codes specify 30 to 40 pounds per square foot as the "live" load for floors in dwellings. Schoolhouse floors generally are designed for a "live" load of 50 pounds per square foot. Roof "live" loads are taken at around 20 or 30 pounds per square foot, depending upon the amount of snowfall common in the community.

For the smaller structures which put no great load on footings, a safe design is to make footings twice as wide as the wall is thick and projecting equally on both sides.

**Below frost line**—For all types of buildings it is essential to extend the foundation below possible frost penetration even though firm bearing soil is found at a shallower depth. The foundation then will not be upheaved by freezing. In general, common practice in the community is the best guide to the depth required to get below frost. In some districts frost penetrates as deep as 6 feet.

Under the foundation walls of a barn a concrete footing 2 feet wide and 12 inches deep usually will be sufficient. Small residences generally require footings 18 inches wide and 12 inches deep. Footings 12 inches wide and 8 inches deep will serve to support icehouses, milkhouses and poultry houses. Foundation walls enclosing basements, such as for small and moderate-sized residences, generally are from 8 to 12 inches thick.

Aggregates usually are wet and sometimes very wet. In either case the amount of mixing water is reduced by the quantity present in sand and pebbles because the moisture present in the aggregates is free to act on the cement. A cubic foot of wet sand holds around a quart of water, while as much as a gallon may be contained in aggregates that are very wet.

Where the foundation is located in poorly drained soil and is to form the enclosure for a basement or cellar, water-tight concrete is desirable. The recommended mix for water-tight concrete is one containing not over 6 gallons of water per sack of cement. In this case a trial batch contains aggregates in the proportions of 2¼ cubic feet sand and 3 cubic feet pebbles, varied as described, to give a workable mix. The use of not to exceed 6 gallons of mixing

**Spading of concrete in wall forms forces the coarse aggregate back from the face and produces a smooth surface on the finished wall**

water per sack of cement insures an impervious concrete provided sand and pebbles are added in amounts and proportions that will produce a plastic workable mix.

A workable mix is one that can be placed readily in the forms without separation of ingredients, and that with spading or tamping will fill all angles and corners of the forms. In a workable mixture there is sufficient cement-sand mortar to give smooth surfaces free from rough spots, called honeycombing, and to combine the pieces of coarse aggregates into a mass that will not separate out in handling.

Forms may be removed as soon as concrete has hardened sufficiently to be self-sustaining. In warm weather, one or two days provides enough time for the concrete to harden so that it will stand by itself.

Mortar for basement or foundation wall construction of concrete block is composed of 1 part portland cement and 3 parts clean sand, with 10 pounds of lime added for each sack of cement. The limited amount of lime is used to make the mortar more plastic or "fat." The sand should pass a screen having meshes ¼ inch square and

should be graded evenly from fine to coarse. Mortar should be mixed thoroughly, with only enough water added to give the desired plasticity and workability. Thorough mixing improves the plasticity and less mixing water is required to obtain a workable consistency in mortar when time of mixing is increased.

Moisture is necessary for the proper hardening of concrete. If this fact is kept in mind, no difficulty will be encountered in the proper curing of footings and foundations. Wall sections should be covered with moist canvas or burlap.

**Water-tight walls**—It costs much less to build a water-tight wall than to repair a leaky one. Consequently, the time to make a basement wall water-tight is when it is built. Cast-in-place concrete foundations easily can be made water-tight if the amount of mixing water used in making the concrete is regulated in accordance with instructions on page 2. For concrete masonry foundations in ordinary well-drained soil, the most important precaution is to see that joints are well filled with cement mortar and carefully pointed.

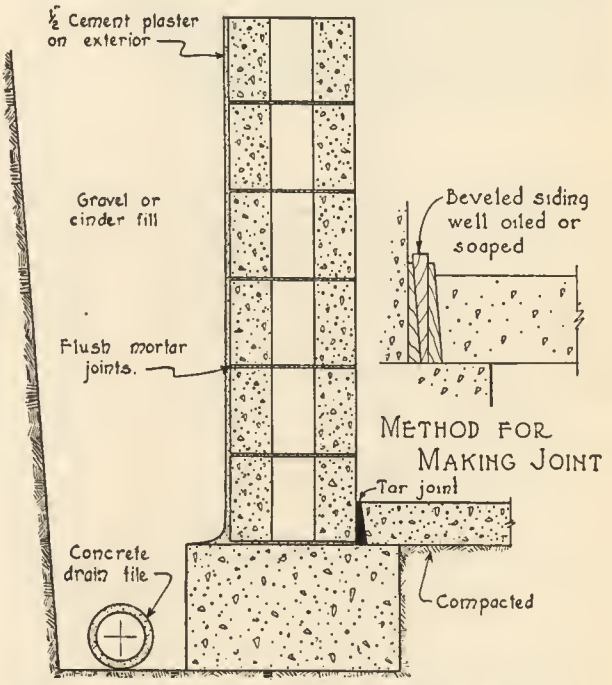
In heavy, water-logged soil the pressure of water may be great enough to force its way through construction seams. The following precautions will guard against the possibility of leaks developing through defective joints. Similar methods are useful in repairing leaky basements and for insuring water-tightness in basements built of concrete masonry.

In each case a line of concrete drain tile is placed entirely around and outside of the footing and is connected to a suitable outlet. The excavation above the tile is filled to within a foot of the grade line with soil, cinders or some other material of a porous nature to provide a fill that will allow water to seep through quickly. When the foundation is erected so near another building that it is impossible to run a line of tile around the outside, the tile may be placed on the inside of the footing and slightly below it. When there is considerable water in the soil it often is advisable to place lines of tile both inside and outside of footings.

As a further precaution in securing a water-tight basement wall, two or more coats of portland cement plaster may be applied to the exterior surface as soon as wall forms are removed, or, in the case of a concrete block wall, just as soon as the mortar joints have hardened. The plaster is mixed in the proportions of 1 part cement to 3 parts sand. No lime should be used in plaster which will be in contact with the soil. Before applying the plaster, the surface should be dampened evenly to secure uniform suction.

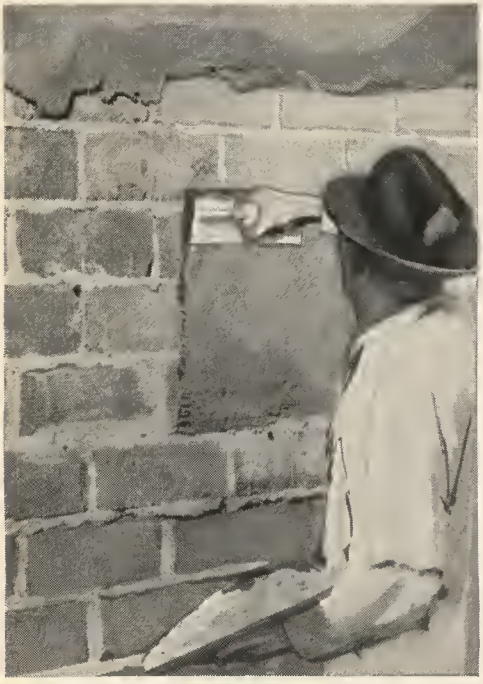
Concrete floors in basements should be at least 4 inches thick. A 5 or 6-inch slab is desirable if unusual loads are to be supported and, where pressure of ground water is heavy, an even greater thickness is recommended. In the latter case, steel reinforcement often is used to strengthen the floor slab to prevent any subsequent tendency to crack.

**Wall and ceiling treatment**—If space in the basement is to be utilized completely, it is well to fur the exterior walls on the inner surface and apply a coating of portland cement plaster on metal lath. The




**A concrete masonry basement which has been protected against external water by proper drainage, a coating of portland cement plaster over the masonry, and water-tight joints between floor and wall**

plaster may be applied directly to partition walls of concrete masonry construction, and to exterior walls that do not require furring. Portland cement plaster on concrete masonry should consist of two base coats, each ⅜-inch thick, and a finish coat approximately ⅛-inch thick, using a 1:3 mix throughout.



**Old walls are made more sanitary with cement plaster**

In basements that are used for storage or service space, no further treatment need be given concrete ceilings than that provided by the first floor construction. If the first floor construction is of non-firesafe material, it should be covered with metal lath and portland cement plaster. Even in the case of firesafe first floors it is often advisable in the interest of cleanliness to construct a smooth, impervious ceiling of portland cement plaster.

**Walks, floors, pavements**—These structures involve simple operations and can easily be made if care is taken to plan the work and execute it by approved methods. The principles involved in building various types of farm pavements are the same. The only practical differences between walks, feeding floors, barn floors, etc., are the arrangement of the forms for convenience in handling the work and the methods of shaping and finishing the top surface.

The first step in the construction of a pavement is the preparation of the site. The ground should be cleared of all tree roots and vegetation and graded to the proper slope or level. Fills necessary in grading should be made in horizontal layers, about 6 inches thick and thoroughly rammed or otherwise compacted, to avoid settlement after the concrete is laid.

After the topsoil has been removed and the site properly graded, an excavation must be made over the area of the pavement, equal in depth to the thickness of the concrete slab plus the sub-base, if one is required. Care must be taken to secure uniform depth so the slab will have its full thickness throughout.

A porous sub-base is necessary for both outside pavements and inside floors where the soil is heavy and holds water. Also a sub-base is advisable if it is necessary to fill in the space below the floor with loose dirt. Ordinarily 6 to 8 inches of gravel, clean coarse sand, or cinders is sufficient to form the sub-base, which should be well compacted by wetting and tamping. Where the soil is porous and well drained the slab is placed directly on the ground. Sometimes tarred felt is placed under the slab of inside floors as an aid in preventing dampness.

All concrete pavements should preferably be located where the drainage is good, so that water will not stand in the sub-base. Where this is not practicable, and especially when the soil is of stiff clay or the pavement is set lower than the surrounding ground, drainage outlets should be installed to carry off water that might collect and cause injury by freezing. Small trenches filled with gravel or cinders, sloping to ground lower than the sub-base, are effective. In addition to the drainage of the site, surface drainage should be provided so that water will not stand on the pavement. This is accomplished by pitching the pavement ⅛ to ¼ inch per foot to a trap, gutter, or other outlet.

**Thickness of slab**—Pavements for farm use are best if built in one course the full thickness of the slab, using the same mixture of concrete throughout. The two-course type is used chiefly for walks and inside floors where a smooth finish is desirable, and is built with a thick base of concrete and a ¾ to 1-inch top course of mortar.

No concrete slab, especially if exposed

**Producing an even concrete floor finish—A long float will remove the inequalities left by the short float and produce an even, plane finish. Notice the absence of water at the surface**

to outside conditions, should be less than 4 inches thick. Floors of poultry houses and basements of dwellings, in well-drained locations, are sometimes made 3 inches thick, but a slab of uniform thickness is difficult to get, and unless the concrete is fully 3 inches thick the floor is likely to prove unsatisfactory.

The slab should be 5 or 6 inches thick where large animals, such as farm horses, will walk on it, and 6 inches or more where traffic is heavy. Where traffic is very heavy or the ground insecure, reinforcement consisting of ¼-inch or larger rods spaced 12 inches on centers in both directions, or woven reinforcement having No. 8 wires every 6 inches, may be necessary.

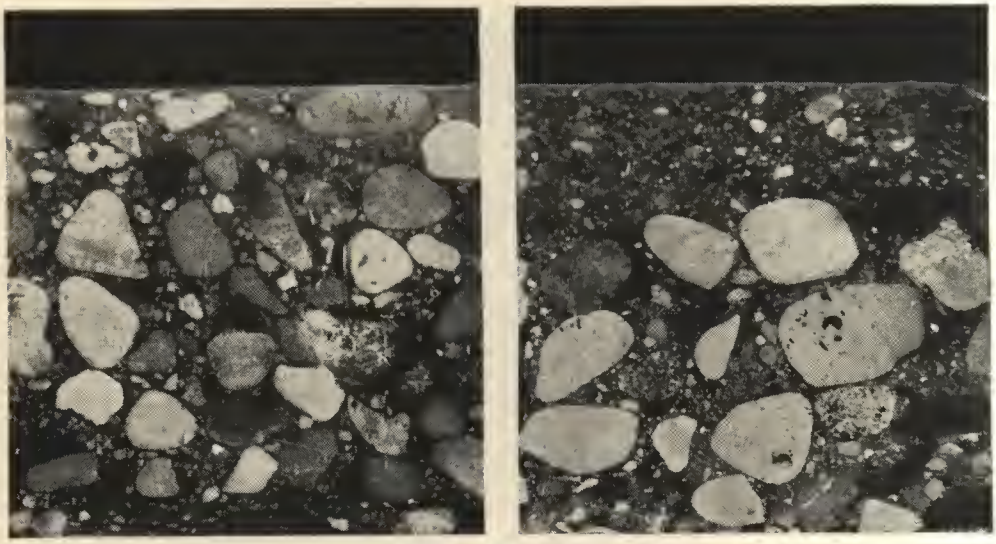
In two-course work the bases of 4- and 6-inch slabs may be 3¼ and 5¼ inches. The top course should never be less than ¾ inch thick; sometimes, when subjected to heavy loads, it is made 1½ inches thick.

**Forms** — Usually 2-inch lumber of a width equal to the thickness of the concrete slab is used for pavement forms. Sheet metal or ½-inch boards are utilized around curves. Forms are generally set after the sub-base has been placed and should be held rigidly in position by stakes placed close enough together to prevent bulging. The top edges of the forms should be carefully set to conform to the finished grade.

For convenience in building and to provide for expansion and contraction, concrete slabs, whether for inside or outside paving, should be laid in blocks. No slab should be larger than 10 feet square for inside floors nor larger than 6 feet for outdoor use. These recommendations regarding blocking off do not apply to road construction nor to supported reinforced floors, as such work is generally done in accordance with special specifications and design.

The first step is to lay 2-inch scantlings to grade and line along two sides of a number of blocks, the width of a block apart, or along the two sides of a walk. Marks should be made on these side forms, where the cross joints or block divisions are to be located, to facilitate setting the transverse forms and so that grooves in the top course of a two-course pavement can be made exactly over the joints in the base. Strips of tarred felt should separate successively cast blocks.

**Expansion joints**—Expansion joints consist of spaces one-half to 1 inch wide, extending the full depth of the slab and filled with asphalt, strips of felt made especially for the purpose, or folded strips of tar felt. Generally such joints should be located along abutting buildings, near trees, at curbs, both ends of curves, around manholes, and 20 to 30 feet apart in straight walks. The importance of properly located expansion joints is not realized until the paving buckles, shears off a manhole, or pushes a light structure or curb out of alinement. A very common error is to omit the expansion joint where an inside floor abuts foundation walls. A ¾-inch joint should be provided around the perimeter,



The difference between a good concrete floor (left) and one improperly mode (right) is shown by cutting a section through the floor. The loyer of weok moterial ot the right is the result of over-troweling, causing fine particles to rise to the top

and when the floor covers a large area there should be several transverse and longitudinal joints one-half inch wide. If the joints are filled with asphalt or a suitable mastic there should be no question regarding sanitation or watertightness.

**Materials**—The coarse aggregate for the base should vary in size from one-half to 1½ inches but should not be larger than 1 inch for one-course construction. Coarseness and ability to resist abrasion are two essential qualities of the fine aggregate, especially for the top coat. Sand, 40 percent of which is composed of ⅛- to ¼-inch grains is not too coarse, as considerably less fine aggregate is required for the finish concrete of floors than for that of normal concrete. Where the pavement is to be subjected to heavy trucking, as in some storage buildings, aggregates in the wearing course should have the toughness and hardness possessed by trap, fine-grained granite, and quartzite.

In two-course work, concrete for the base is generally mixed in the proportions of 1:2½:5, though 1:3:6 will give good results when first-class materials are used. The mortar for the top course is usually mixed 1:2. Concrete for one-course pavements is generally a 1:2½:3½ mixture.

Concrete should be mixed to a jellylike consistency, but mortar should be mixed to a stiffness that will require it to be scraped from the bucket or barrow. If made too wet, several trowelings will be necessary to obtain the final finish, in which case the wearing quality of the concrete is impaired.

**Placing the concrete**—Just before the concrete is deposited, the ground, or the cinder sub-base if used, should be wetted down with water. In one-course construction the concrete, after it is placed, is compacted by tamping until mortar flushes to the surface, and then leveled off with a straightedge even with the side forms. Where a smooth surface is desired the final floating and grooving is not done until the concrete or mortar has been in place from 1 to 4 hours and has partly set. In two-course construction the concrete base is lightly tamped and leveled off, or screeded, with a template notched over the side forms to the proper depth for the top course. If an excess of water appears on the surface it should be soaked up by burlap bagging or similar material spread for a few minutes over the concrete, because free water in the base course will reduce the strength and durability of the top course. Unless the base is to be left roughened, the top course must be placed while the base is still plastic, not more than one-half to three-fourths of an hour after the base is laid, and screeded flush with the top of the forms and at the right grade. While some compacting occurs during the screeding, the top course should be further consolidated by floating or rubbing the surface

with a wood or cork float to fill up hollows and smooth out the humps left after screeding. Sometimes when further density is desired additional coarse aggregate is scattered over the surface and forced by the float into the mortar topping.

The placing of the top course may be deferred until the base hardens. In this case the base should be laid as previously described, and while the concrete is still plastic the surface should be scored with a stiff broom and cured for not less than 10 days to permit initial shrinkage due to hardening. Before the topping is placed, the base should be thoroughly cleaned by being scrubbed with clean water and a stiff brush, foreign substances which cannot be chipped away, and the areas roughened with a pick or cold chisel. Just before the topping is placed, the base should be wetted, but there must be no pools left on the surface. A thin coat of grout should be broomed into the surface of the slab for a short distance ahead of the topping. The wearing course is placed and finished in the same manner as described for laying it on a plastic base.

**Finishing the surface**—Occasionally the top course is cut through, over the joints in the base, and the surface marked off by small grooves. This is not structurally essential, but improves the appearance of the pavement by breaking the monotony of an otherwise undecorated surface. After the top course has been placed, the location for the grooves is determined by the marks previously made on the side forms and found exactly by running the point of a

**Wood float smoothes out uneven surfaces after concrete becomes quite stiff**

**After concrete has hardened, the steel finishing trowel is employed to make a smooth surface**

small trowel through the top course and into the base joint. The trowel is guided by a straightedge and run across the width until a complete cut is made. The four edges of each block are then rounded off with a groover or edging tool. Marks or rough places are erased and the surface given a final finish with a wood float.

A slippery pavement is always undesirable, especially where stock is kept. A rough surface resembling corduroy in appearance offers good foothold and can be easily produced in varying degrees of roughness by sliding a straightedge along the side forms with a sawlike motion and at the same time jigging it up and down a little. This should be done while the concrete is fairly soft. A very satisfactory finish for feeding floors is obtained by roughening the surface with a stiff broom after the concrete has set sufficiently, after all the liquid has disappeared. Sometimes foothold for animals is provided on smooth surfaces by making parallel grooves one-fourth to half an inch deep and about 6 inches apart in two directions.

A finish of a gritty or sandlike texture that is smooth but not slippery may be obtained by sprinkling a little sharp sand over the surface and lightly rubbing it in with a wooden float used with a circular motion. A glassy surface is produced with a steel trowel after the concrete has set fairly hard. Experience is necessary in determining the exact time for final troweling and in obtaining various effects produced by the different methods of finishing.

Too much troweling of the surface or troweling too soon after depositing the concrete not only makes the surface slippery but also brings an excess of fine material

to the surface. This affects the wearing quality of the pavement and is likely to cause dusting and hair cracks, which, though not detrimental, mar the appearance of the surface. These cracks may also be the result of too much fine sand.

**Curing**—Neglect in curing a pavement is a more serious matter than is ordinarily appreciated. Foot traffic should be kept off the pavement from 2 to 3 days; animals and heavy loads should not be allowed on the paving for about 2 weeks after the concrete has been placed. Paving that has not hardened sufficiently to resist pitting may be protected from rain with a 1-inch layer of sand. It is not advisable to lay outside pavements in freezing weather. Manure should never be used to cover newly laid work because it contains acids which react on the green concrete.

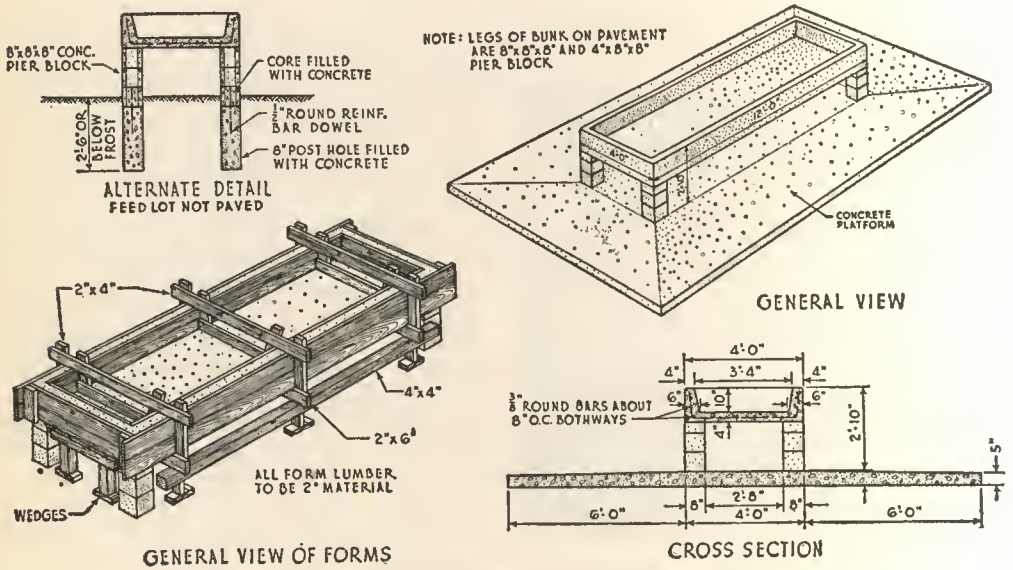
**Cattle feed bunks**—Cattle feed bunks must be of sturdy construction to withstand the hard usage encountered in the feed lot.

Where the feed lot is paved the legs or supports for the bunk are made by placing 8x8x8-in. concrete pier blocks as shown, then forming is installed as shown for the reinforced concrete feed trough. Dimensions of the feed bunk may be altered to fit individual conditions. The bunk may be from 3 to 5 ft. wide, from 2 to 3 ft. high and in such lengths as needed to meet requirements. Where the concrete feed bunk is built for an unpaved lot, small concrete footing piers should be built under each support as shown in the alternate construction detail.

**Feeding floors**—Size of floor to build depends upon individual requirements. If the entire feed lot or barnyard cannot be paved at one time, a strip of concrete 15 to 20 ft. wide in front of the cattle shed or hog house will be a tremendous improvement over an unpaved lot. Cattle feeders usually build 30 to 40 sq. ft. of floor per head of cattle. Feeding floors for hogs are commonly large enough to provide about 10 to 15 sq. ft. of floor per hog.

Concrete feeding floors should generally be built about 4 in. thick unless driven over with heavy vehicles, in which case they should be built about 6 in. thick. The floor should be formed in sections about 10 ft. square. If it is necessary to place the concrete feeding floor in a poorly drained location, best results are obtained by placing the concrete slab on a well-tamped fill of about 6 in. of fine stone, gravel or cinders. If the feed lot is on fairly high, well-drained soil, no fill is needed under the floor.

It is sometimes desirable, to place a low curb around the edge of the feeding floor and an apron or cutoff wall extending into the ground about 1½ to 2 ft. The apron or cutoff wall wall prevents undermining of the floor. The floor should be finished

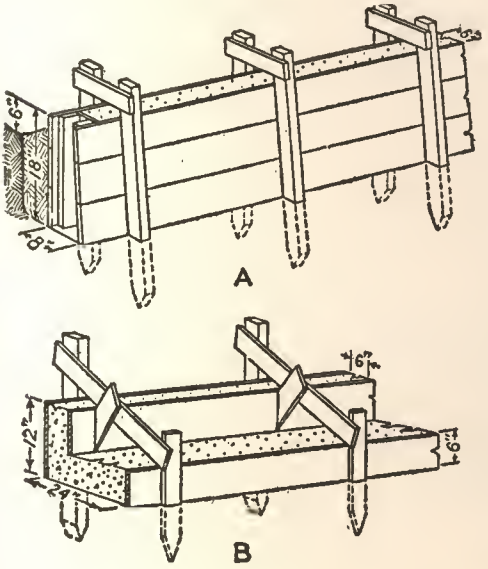


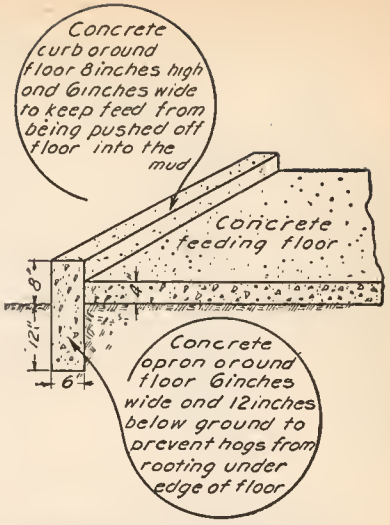

**Method of building permanent concrete cattle feed bunk**

with a wood float to leave an even yet gritty, nonslip surface. Good floor drainage is provided by sloping the floor about ¼ in. per foot.

**Curbs**—Frequently curbs are used in connection with the different types of paving. Curbs may be of either two-course or one-course construction, but the tendency is toward one-course work; that is, the same mixture throughout. A good finish can be obtained by properly tamping and spading the concrete, removing the forms as soon as practicable, and troweling the surface.

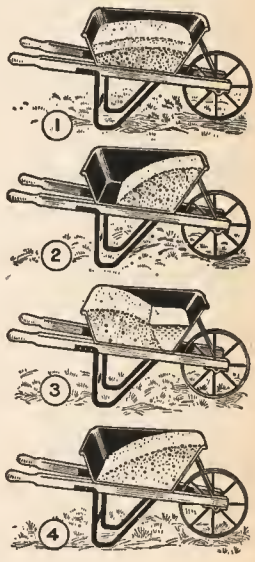
The plain curb is usually built 6 to 8 inches thick at the top, 8 to 10 inches thick at the bottom, and 18 to 24 inches deep. Figure A shows how the forms are constructed and braced. Figure B shows the construction of forms for a combined curb and gutter. The curb should be built in sections not over 10 feet in length, and expansion joints should be provided 25 feet apart. Generally a gutter is formed at the intersection of a curb with the paving, and care should be taken to pitch the gutter to outlets or drains for removing surface water. Plain curbs of reinforced concrete may be precast in sections 4 to 8 feet long. They are usually 4 to 8 inches thick and 18 to 24 inches high. The reinforcement may consist of longitudinal rods one-fourth of an inch in diameter, spaced 6 inches apart. The rods should be tied together with wires spaced 6 to 8 inches apart. A piece of heavy woven-wire fencing 1 inch less in length and height than the curb section makes satisfactory reinforcement; the wires should not be less than No. 10 gauge.



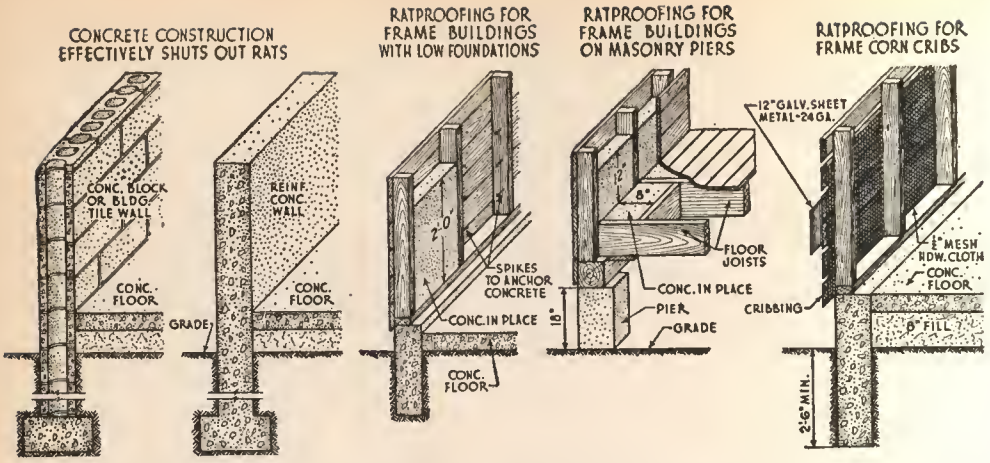




**Sketch showing proper construction of feeding floor**

**Mixing concrete in the wheelbarrow**—A simple and easy method of mixing concrete by hand in a wheelbarrow is shown in the illustration. Fig. 1 shows a batch of dry material consisting of four shovelfuls of gravel, two of sand and one of cement. Fig. 2 shows the first operation, working the material, dry, to the front of the barrow, with a round-pointed shovel. Fig. 3 shows the same batch after it has been worked back again in the same way and some water has been added. The material is worked to the front again, leaving it in the position shown in Fig. 4, and then again backward. Repeat this until it is thoroughly mixed.




If concrete hardens on metal forms before they are cleaned, try a very strong solution of lye. This will soften the concrete without damaging the metal forms.



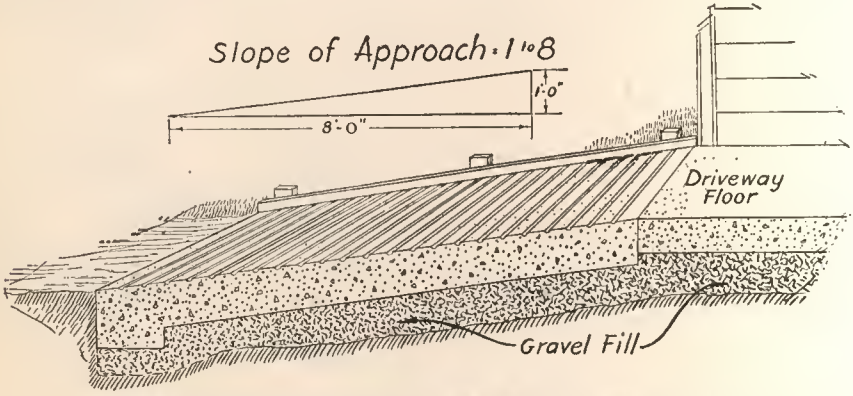

**Ratproofing** — Rats are expensive and dangerous farm pests. They transmit disease germs dangerous to both humans and livestock, they kill many young chicks and birds, destroy grain, damage buildings, and even cause fires by gnawing insulation from electric wires in buildings.

To thrive, however, rats must have a generous and constant supply of food as well as quiet places for hiding and breeding. If these essentials are taken away, rats will leave and seek surroundings more attractive to them. One of the most effective ways to rid the premises of rats is to build of ratproof construction.

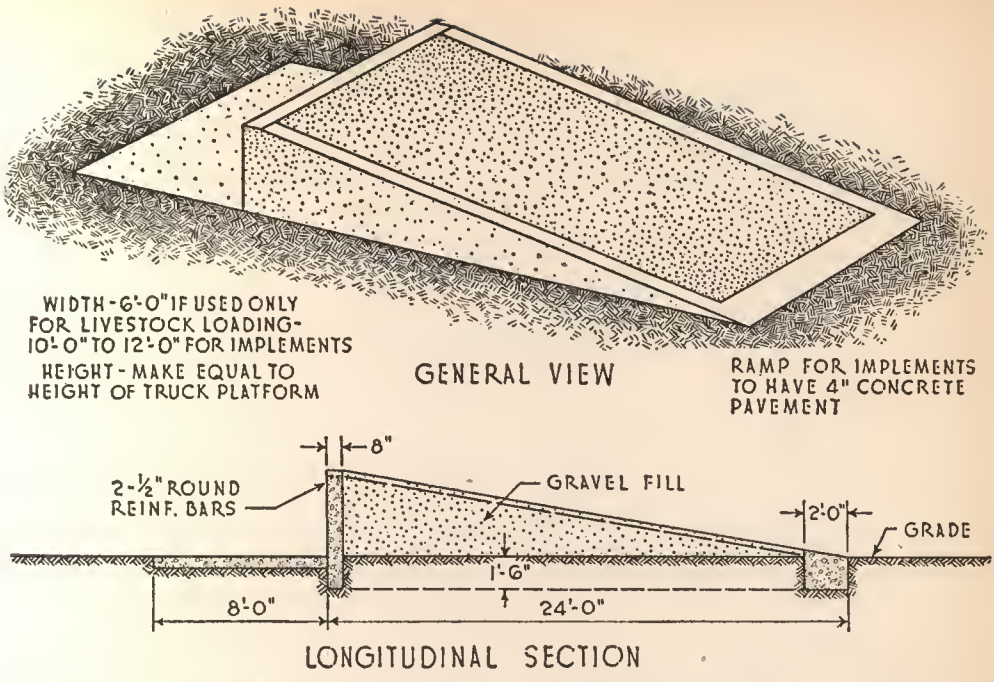
Principal methods of ratproofing buildings are shown above. In general, well built concrete floors, foundations and walls are the most practical barriers to keep out rats. As indicated in the drawings, however, concrete and metal may be used to make buildings of frame construction ratproof. Rats often burrow to a depth of 2 to 2½ ft. so it is important that tight foundation walls extend to a depth of about 2½ to 3 ft.

**Concrete approaches**—There is no better material for driveways to granaries, barns, and other buildings than concrete. It has the necessary strength to withstand the hard usage common to such structures. For ordinary loads, make the slab at least 6 inches thick; if heavy loads are to be carried, the thickness should be 8 inches. Grooves can be cut in the surface with a trowel or can be made by pressing triangular strips into the fresh concrete. For proper mix, see page 2. Finishing is done with a wood float to give the even, gritty surface that prevents slipping.

**Concrete loading ramps**—Loading and unloading of cattle and hogs, heavy machinery and implements can be greatly simplified and speeded if a loading ramp is available. If the ramp is to be used principally for loading and unloading livestock




**Concrete stands up under the heavy usage given approaches to driveways. Grooving the surface assures firm footing**




**Method of building concrete loading ramp. If the ramp is used for loading livestock it is usually fenced**

it is most convenient to build it in, or adjacent to, one of the fenced lots in the barnyard. In such cases the ramp is usually fenced.

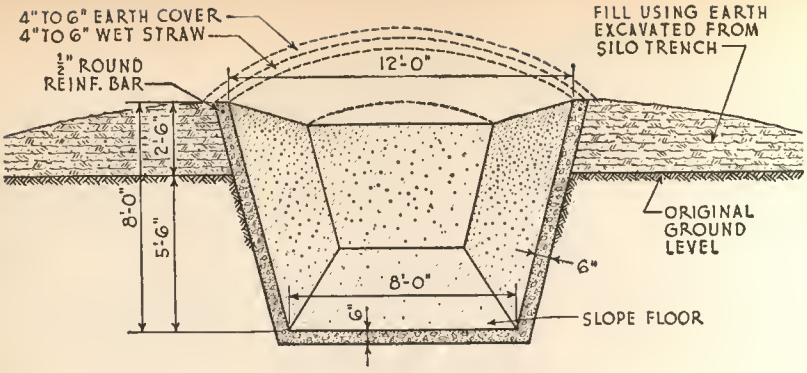
Where the ramp is to be used only for loading of livestock it may be built 6 ft. wide, outside dimensions, which provides a clear passage about 4 ft. wide. Where the ramp is to be used for loading heavy implements and machinery it is generally built 10 to 12 ft. wide.

To be most convenient, the ramp should be built with a gentle slope, usually not steeper than a rise of 1 ft. in a length of 6 ft. horizontally. However, farm ramps commonly vary in slope from 1 ft. vertically in 8 ft. horizontally, to slopes of 1 ft. vertically in 5 ft. horizontally. Height of ramp may be anywhere from 36 to 48 in. depending upon the height of the truck platform. The ramp is usually made of such height that it will accommodate the largest trucks which are to use it. Then for trucks with lower platforms pieces of plank may be laid on the pavement on the loading side of the ramp to raise the truck floor to the ramp level. A small concrete pavement for the loading side of the ramp as shown prevents truck wheels from bogging down under heavy loads or in soft earth. Construction of forms and placing and finishing of concrete for the ramp walls are accomplished in much the same manner as described under "Footings, walls, foundations," pages 56 to 60.

**Concrete trench silos**—A generous and dependable supply of high quality roughage through winter months and through periods of severe drouth often makes the difference between success and failure with the dairy or livestock enterprise. Corn, hay or cane silages are valuable roughages which can be put into the trench silo at low cost to assure ample feed supplies.

The drawing, page 68, shows suggested construction of the trench silo with a permanent concrete lining for best preservation of the silage. Although the silo is often used without lining, experience shows that in most silos it is necessary to install a concrete or other masonry lining within a few seasons. Otherwise the earth banks begin to slough away causing spoiled feed and great inconvenience.

Where underground drainage is excellent some prefer to apply a 3-in. coating of portland cement plaster to the sides of the trench, this coating being reinforced with heavy hog wire or ¼-in. round reinforcing bars spaced 12 in. on centers each way. A concrete floor is almost a necessity to permit convenient hauling out of the trench




**Crass sectian af typicol trench sila**

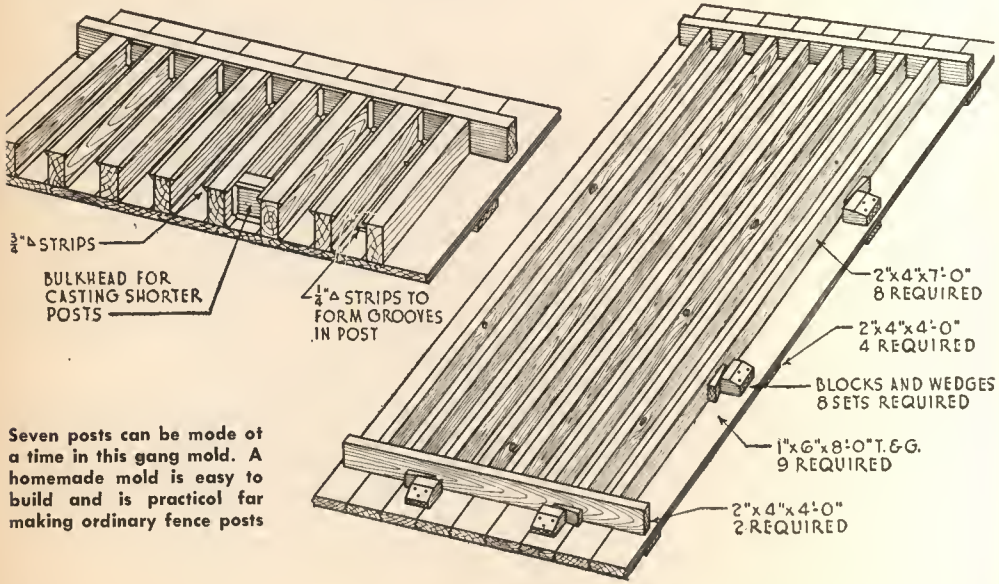
during wet weather. A roof is not ordinarily considered necessary where the trench is lined with concrete. Common practice is to cover the silage in the trench, first with 4 to 6 in. of wet straw, then with about the same thickness of dirt. Well compacted silage of proper moisture content keeps in condition with this covering.

If possible the trench silo should be located on well drained sloping ground near the barn or feed lots. Drainage around the trench is further improved by filling and sloping the banks of the trench as shown in the drawing. Earth is usually excavated and moved with a slip scraper or Fresno. The concrete floor of the trench silo should be sloped at least ¼ in. per foot to drain.

**Fence posts**—Concrete posts have so thoroughly demonstrated their practicability that they should be a part of every program of farm improvement. Posts made of concrete do not require replacement.

The usual length of line posts is from 7 to 8 feet. A strong, neat-appearing post will be obtained by making the base 4 by 5 inches, tapering to 3 by 4 inches at the top; then 2 by 4's can be used for the pallets.

Satisfactory results can be obtained by using homemade molds. Several simple gang molds have been devised; one good type is shown in the drawing on this page. If a level floor is available, it will not be necessary to build a platform. Lumber used in constructing molds should be sound, straight-grained, and finished smooth on the sides that will come in contact with the concrete. Two-inch material is used for the sides and end-pieces and 1-inch boards for the dividers. Small triangular strips are tacked to the pallets,



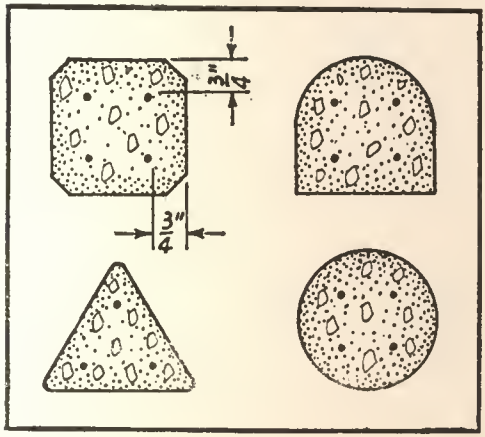

**Seven posts can be made at a time in this gang mold. A homemade mold is easy to build and is practicol far making ordinary fence posts**

which give the post a neat and finished appearance on two edges. The forms should be soaked or painted with oil to prevent the boards from warping and the concrete from sticking to them.

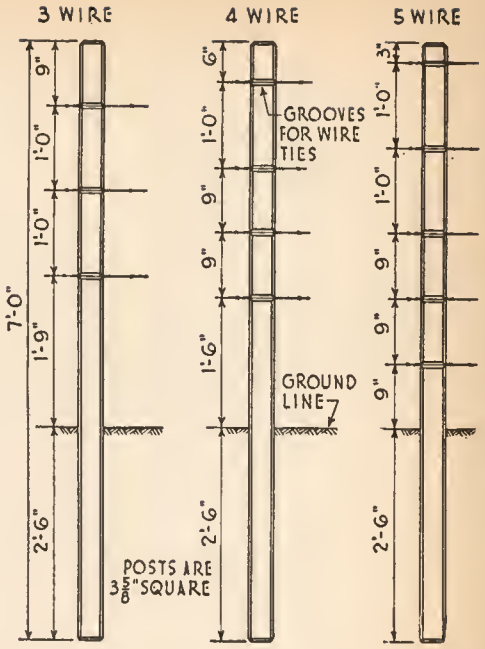
Posts made in metal molds ordinarily are more true to shape and have a smoother surface than posts cast in homemade molds. Whenever a considerable number of posts are to be made the use of commercial molds will be found advisable.

Reinforcing a concrete post deserves special attention. The rods are located near each corner where the greatest strains occur and ¾ inch from the surface in order that moisture will not penetrate to them and cause the steel to rust. Reinforcement placed nearer the center of the post becomes less effective, while if placed nearer than ¾ inch to the surface it is likely to rust, possibly causing the concrete to spall off and the post to fail. One-quarter-inch round or square rods have proved to be most satisfactory for reinforcing concrete posts.

The thoroughly mixed concrete is first placed about 1 inch deep in the mold, then two reinforcing rods are pressed into the concrete, one in each corner, ¾ inch from the side and bottom. The mold is next filled with concrete to within ¾ inch from the top and the other two reinforcing rods carefully embedded in it. The mold is then filled to the top, struck off and troweled. As concrete is placed it should be compacted by jarring or tapping the mold and by running the trowel along the form faces and up and down in the concrete. Care must be exercised not to displace the reinforcement. This operation works coarse particles back from the surface, removes air bubbles, produces a dense concrete and gives the post a smooth surface.




Common shopes of concrete posts



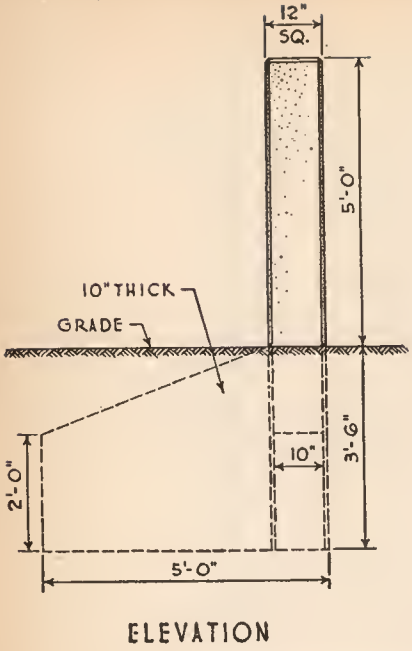

Stondord wire spocing for barbed wire fences

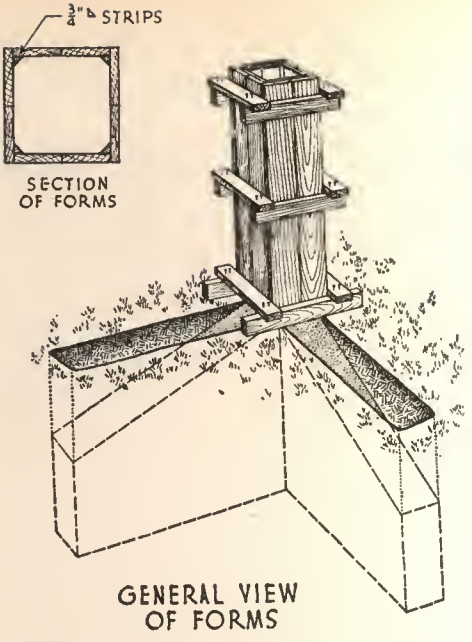
**Taking posts out of mold**—After the molds have been filled they should remain undisturbed until the concrete has hardened sufficiently to permit removing the posts without damage. In summer, 24 hours may be sufficient, but in cold weather more time will be required. Remove from forms carefully.

If made in summer, the posts should be kept in a shady place and should be wetted at least twice daily for 10 days so that they will harden properly. If shade is not available, a covering of straw or sand, kept moist by sprinkling, will be satisfactory. Posts should be at least 28 days old before being set, and, if possible, it is a good plan to allow them to cure two or three months.

**Corner posts and gate posts** — Corner posts, end posts and gate posts are made heavier and stronger than other posts to resist the greater strains imposed upon them. End posts and corner posts may be of similar design except that the concrete brace is needed on only one side of the end post.

In most soils the earth walls of the excavation may be used for forms below ground level. The trench for the concrete brace and the hole for the post should be

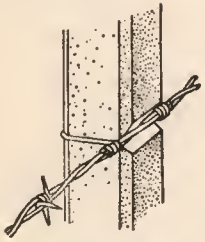



**Suggested form construction for concrete corner posts and end posts**

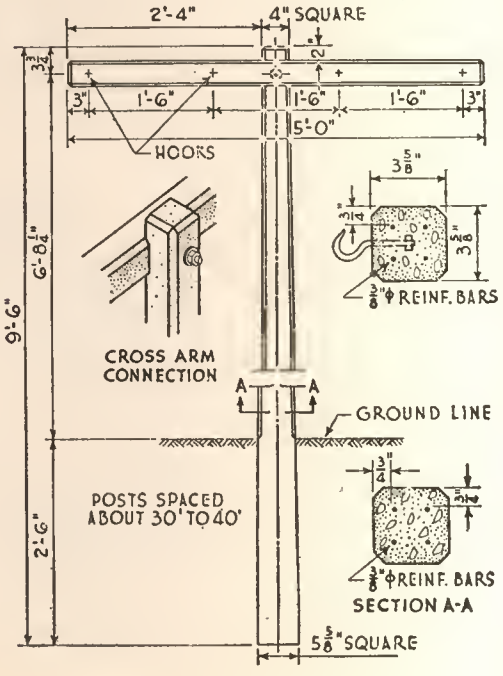
dug at least 3½ ft. deep. The trench can usually be kept narrow and true if dug with a tiling spade or other narrow spade. Forms needed above ground level are illustrated in the drawings. The ¾-in. triangular strips for lining corners of the form help make an attractive post with smooth beveled corners. If desired, quarter-round molding or cove molding may be used for this purpose. Decorative fluting for gate posts at the farm entrance may be provided by fastening triangular strips to the form faces.

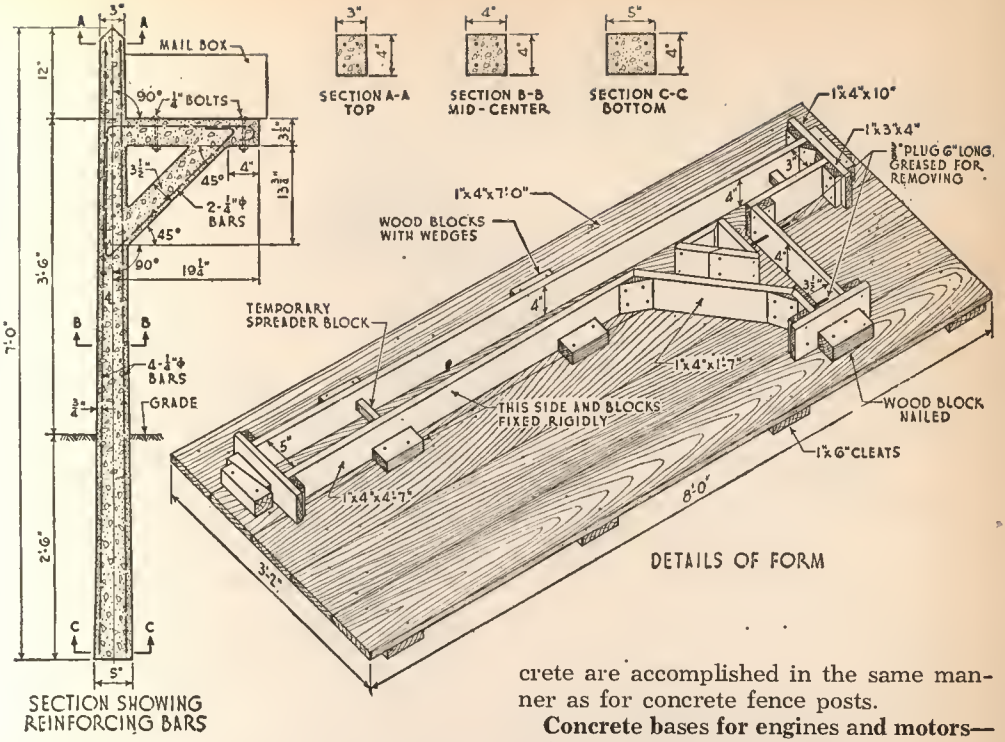
Heavy corner posts ordinarily do not need reinforcement, but if they are to be subjected to unusual strains, ½ in. round reinforcing bars may be placed in the concrete, one near each corner of the post. There should be at least 1 in. of concrete between the reinforcing bars and the surface of the concrete.



**Method of fastening fence wire in the grooves in concrete posts**

**Clothesline posts** — Useful, sturdy, attractive clothesline posts are made as shown below. The 5-ft. cross arm may be made in the standard fence post mold and bolted to the main post. Hooks are cast into the arm as illustrated or ¼-in. diam-



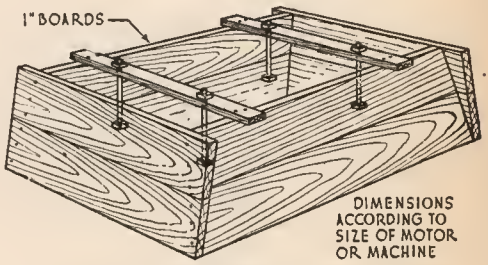



eter holes may be made to receive the clothesline. The main post may be made in a mold similar to the fence post mold by using 2x6 side forms shaped to produce the taper required. Reinforcement of the main post consists of four ⅜-in. round reinforcing bars as indicated in the drawing. Clothesline posts are usually set 2½ to 3 ft. deep and 30 to 40 ft. apart. The post may be increased to 10 ft. long where a 3-ft. deep setting is required. The following materials are required for two complete clothesline posts: 1¼ sacks portland cement, 2½ cu. ft. sand, 3½ cu. ft. gravel, 42 lineal feet (16 lb.) ⅜-in. round reinforcing bars.

**Mailbox post**—A concrete mailbox post or standard is a sturdy, lasting improvement which adds to the tidy appearance of the yard. Side forms may be of 1x4 boards assembled on a smooth platform as shown in the drawing. The post is made 4 to 5 in. wide at bottom, 3 to 4 in. at top, and reinforced with ¼-in. round reinforcing bars. Holes for bolts which anchor the mailbox to the standard are formed by placing ⅜-in. greased dowels or bolts in the form as shown. Placing, finishing and curing concrete are accomplished in the same manner as for concrete fence posts.

**Concrete bases for engines and motors**—Solid concrete bases for electric motors, gas engines and other machinery reduce vibration to a minimum, thus improving machine performance.

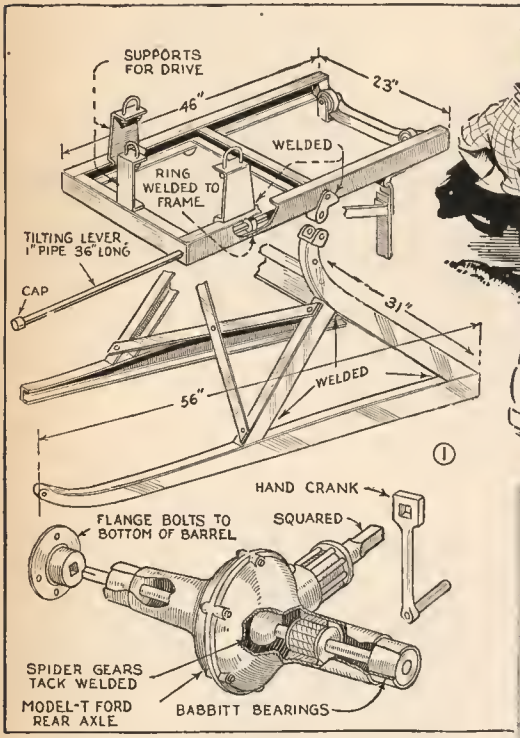
Anchor bolts for holding the engine or motor in place are set in the fresh concrete, care being taken to locate the bolts accurately. This can be done by supporting the bolts in the proper positions with crosspieces as shown in the drawing, or a templet of stiff paper may be made as a guide in spacing the anchor bolts. It is well to recheck measurements to make certain that the bolts are in the exact positions required. The suggested concrete mix for engine bases is 1 sack portland cement to 2¾ cu. ft. sand to 4 cu. ft. gravel.

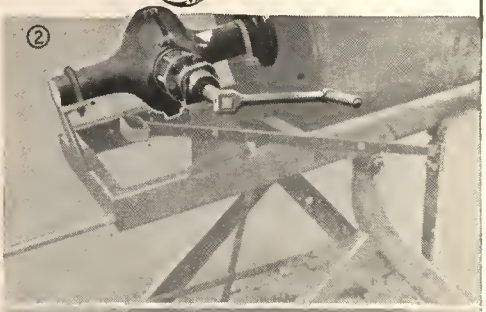


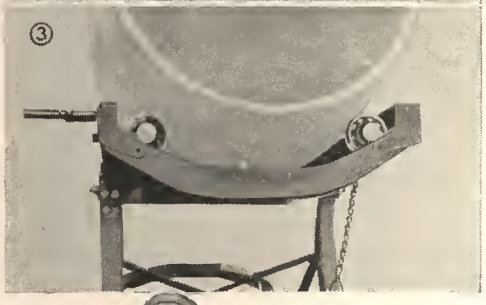

**Forms for concrete bases for motors, engines and other machinery**

The publishers are indebted to the Portland Cement Association and the U. S. Department of Agriculture for the use of some of the articles and photos included in this book

# Small Cement Mixer Has Geared Hand Crank



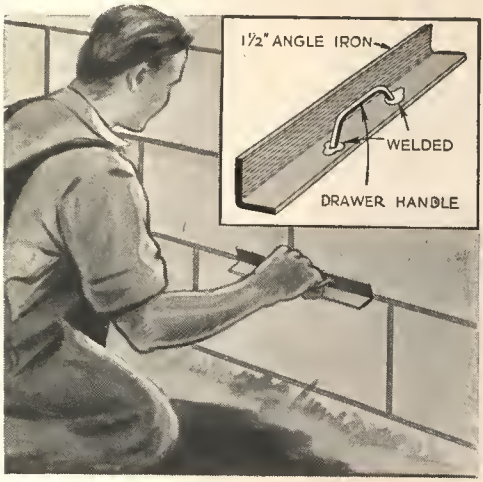


Auto parts and a 60-gal. barrel comprise this rotating cement mixer. Auto frames were cut and joined by welding. A section with the shackle ends forms the sled, and a similar section with shackles upturned, and suitably braced, supports the mixer frame which is pivoted as shown in Fig. 1. In Fig. 2 the frame is shown in the mixing position where it is held by means of a sturdy iron prop. This is pivoted to the frame and attached to a slotted handle which slides back and forth on two bolts so the prop can be moved on or off a small metal block welded to the inclined brace. To disengage the prop, first push down on the tilting lever, which is a pipe that can be slid under the drum when not used. A cut-off rear end is mounted concentrically in line with the drum. The cut-off drive shaft has a squared end to take a crank for turning the drum, which rests on two ball bearings at each end, Fig. 3. The chain shown here was originally used to hold the drum in the mixing position but the prop was found an improvement.

—Jos. C. Coyle, Yuma, Ariz.

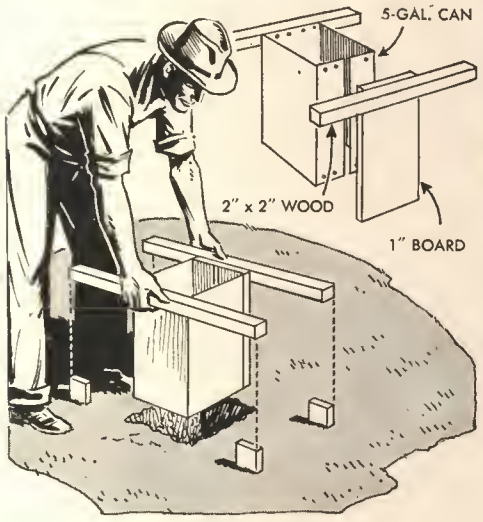
# HELPFUL CONCRETE HINTS

### Joints Between Concrete Blocks Shaped With Improvised Tool




When pointing joints between concrete blocks, or laying up a new wall, and there is no regular tool for finishing the joints, one can be improvised from a length of angle iron. A drawer handle welded on the angle iron provides a good hand grip, although any suitable grip can be used if the tool is intended for only temporary use.

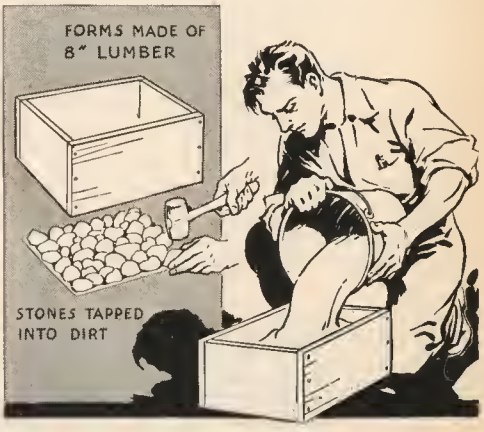
### Discarded Oilcan Used as Form for Top of Concrete Pillar




Where the ends of concrete pillars for foundation and center support posts extend above ground level, handy forms often can be improvised from 5-gal. oilcans. These are adapted by removing both ends and then slitting each one down the side. The cut sides are bradded to blocks of wood, after which supporting crosspieces are attached as shown, to provide a means of adjusting the forms to proper height with wood blocks or stakes driven into the ground. If inside surfaces of the cans are well oiled before pouring the concrete, the forms will separate from the concrete easily as the brads can be pulled through the tin. In loose soil, it may be advisable to use additional cans as the hole is dug to prevent cave-ins.

### Cobble Stones Imitated Easily With Cement Blocks

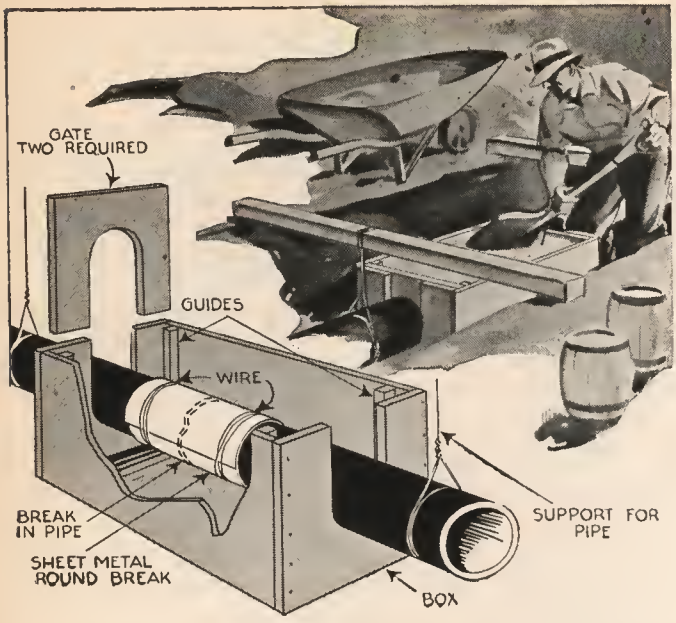
I wanted a cobble-stone garage, and not being a stone mason, I produced a cobble stone effect by making it of cement blocks faced with stones. To make the blocks, first




build a few wooden molds of the desired size with two opposite sides open. Then level off and pack down a square of ground equal to the size and shape of the molds. Now wet the ground and place the cobble stones on it, driving them into the ground a distance equal to not more than half their thickness. Next set a form over the stones and fill it with cement. When this has set, remove the form and wash off the dirt from the stones. This will give you a block with stones anchored securely in one side. By working out the stone design carefully in each block, you can make a wall that will resemble closely one that was laid up with stones and mortar.

—A. H. Waychoff, Phoenix, Ariz.

# Broken Pipe Line Easily Repaired With Concrete




When a break or leak occurs in a pipe line, a repair often can be made as indicated. First line up the two broken sections and wrap them with sheet metal, which is then held in place with wire. A box is now fitted around the break and closed at each end with a gate. A cement mortar consisting of cement, 1 part, and clean sand, 3 parts; is poured into the box. This should be large enough to give at least a 2-in. thickness of mortar on all sides of the pipe, and more if the pipe carries high pressure. It is important that the pipe be well supported, either by props from below or by suspension from above. Small leaks are repaired similarly, except that support for the pipe usually is unnecessary.

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**Level Fastened to a Straightedge Lines Up Concrete Forms**

A contractor attaches a level to his straightedge when using it to line up concrete forms. This enables him to span the space between the forms and saves time in getting both sides of the forms to the same height. The level is attached by putting two short dowels in the straightedge for insertion into two holes drilled in the edge of the level.

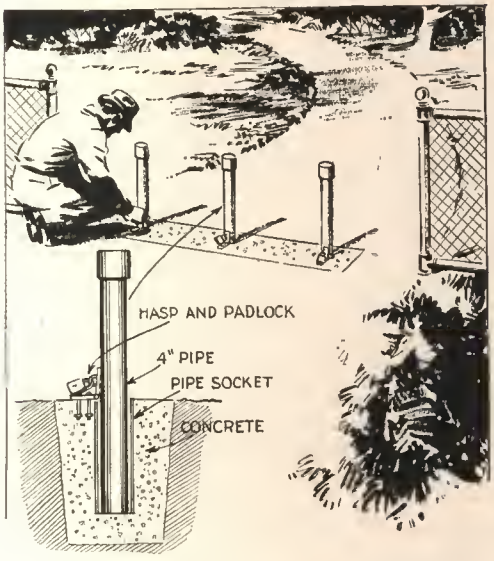

**How to Clean Garage Floors and Concrete Drives**

There is a comparatively simple method for cleaning garage floors and concrete drives at oil stations. From time to time concrete builders may be asked by their present and sometimes prospective customers how such cleaning can be accomplished. Concrete floors and driveways where oil drippings have collected are successfully cleaned and renovated by the use of portland cement as follows: All excess oil is wiped off the surface of the concrete or it may be scrubbed quite clean, first using a little kerosene or gasoline to cut the oily deposit. A little vigorous scrubbing with a stiff brush removes most of this oil. The surface is then thoroughly flushed with a hose stream of clean water and kept wet for about ten minutes. While the pavement is still moist, dry portland cement is dusted over it. An ordinary flour sifter may be used for this purpose. The whole

surface is then swept with a fine broom. On drying, this leaves the pavement white and covers up stains which cannot be cleaned off completely. Some stations prefer to do this just before closing, so that the cement may harden over night. Others stations do it early in the morning.

### Posts at Gate to Public Grounds Are Padlocked in Place

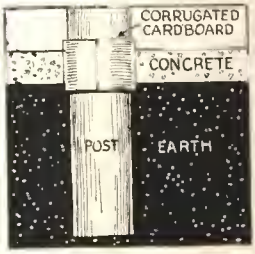
Where it is desired to prevent the entrance of vehicles into public parks, school grounds, etc., except on special occasions, removable posts can be assembled from



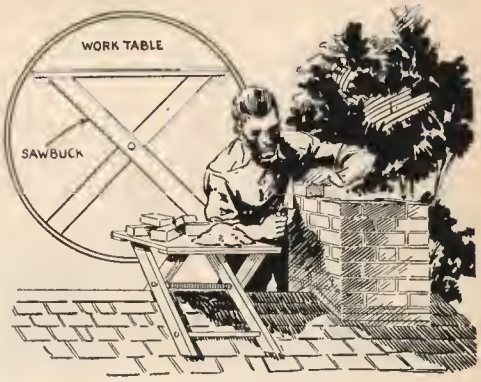

pipe and padlocked in place. The posts fit into lengths of pipe set in concrete, and have a large U-bolt welded to them to fit a hasp anchored in the concrete with bolts.

### Setting Wood in Concrete

When concrete is poured around posts or timbers it is likely to crack unless some type of resilient joint is provided between the two materials. Such a joint can be made by wrapping corrugated cardboard around the posts or timber before pouring the concrete. The cardboard is removed, after the concrete sets, and tar or asphalt poured in the opening.



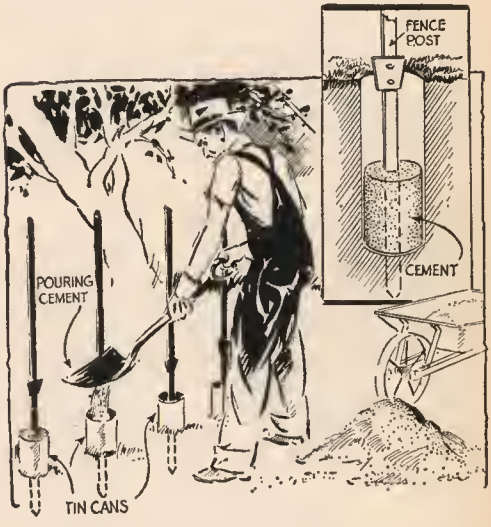

### This Worktable Straddles Roof While Repairing Chimney




To provide a worktable for holding bricks and mortar, and to eliminate the usual trouble of building one on the roof each time, one workman carries a light, folding sawbuck and a table top with cleats across the underside. In use, the buck is opened to straddle the ridge of the roof and the top is placed so that the cleats keep the buck from spreading.

### Cement Anchors Put on Posts With Tin-Can Forms

Farmers who prefer steel fence posts anchored firmly with cement need not convey the cement, sand, gravel and tools to the field as it is possible to attach such

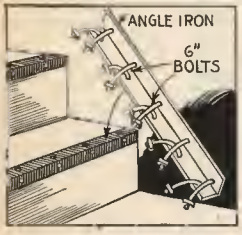



anchor pieces before the posts are set. A number of posts are driven in to the ground a few inches through large-size tin cans, after which the cement is poured.

### Large Breaks in Plastered Walls Are Easy to Patch

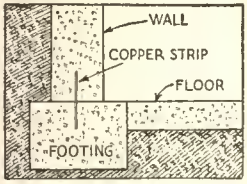

Anyone can do a workmanlike job of patching breaks in plaster if a simple procedure is followed. If the break is a small crack, remove the crumbled material and undercut the edge of the firm plaster. But if the break is large and the laths are broken, remove the damaged plaster and cut away the broken parts of the lath. Then undercut the edges of the firm plaster and tack a piece of screen wire over the lath. Dampen the edges of the plaster so that the patching material will bond to it thoroughly. Regular patching plaster, which you can buy in any amount desired, is best, although a mixture of plaster of paris and water will do.

### Edges of Concrete Steps Protected by Lengths of Angle Iron




When building concrete steps, it's easy to install angle-iron edges on the steps to protect them against chipping or cracking. Drill several holes in each piece of iron to take flat-head bolts, which are fitted with nuts and then bent so that the ends will extend into the concrete when it is poured. Set the irons right in the form, pour the concrete and then trowel it down smooth and flush with the edges of the irons. When the forms are removed, the irons will be imbedded firmly in the edges of the steps.

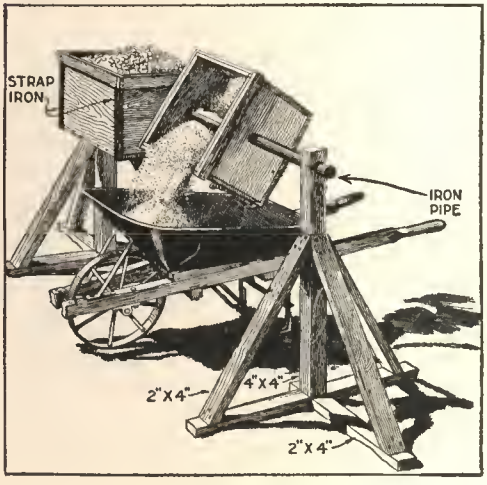
### Waterproofing Concrete Walls




When a concrete footing is poured and later the wall poured upon it, the bond between them is not always watertight. To prevent seepage through such a joint, a contractor inserts a 4-in. strip of medium-gauge copper as shown. Half of the strip is imbedded in the footing, and the other half is buried in the wall when it is poured.

### Tip Boxes Measure Concrete Materials Economically

In the mixing of concrete, the materials should be measured accurately if the best results are to be obtained. Sometimes the wheelbarrow, in which the materials are carried to the mixer is used for a measure. To insure accuracy in measuring the materials, and also a minimum of wasted time, the tip-measuring boxes shown in the sketch were made. The boxes are made with the desired cubic capacity, and hung above the center on a 1½-in. iron-pipe axle. The boxes should be hung high enough to permit a wheelbarrow to be pushed under the bottom without interference. The supports are made of 2 by 4 and 4 by 4-in. pieces, strongly braced. The outfit may be dismantled quickly, and re-

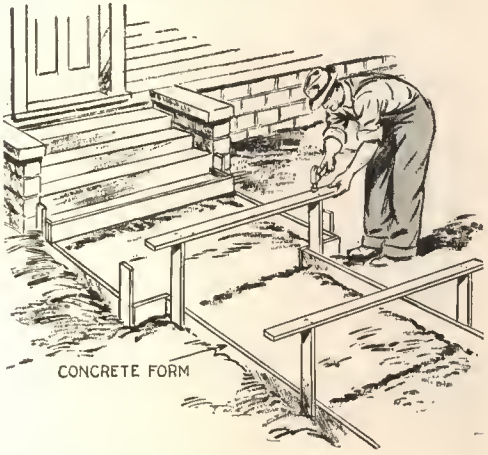


assembled at another location, and the parts are of handy size for loading on a vehicle. In use, the shovelers fill the boxes, and the barrow men wheel their barrows under the boxes, which are promptly dumped. They are then filled again, ready for the return of the barrows. Several boxes are usually desirable. For example, if a concrete of 1 part cement, 2 of sand, and 4 of stone is to be mixed, and each batch comprises 10½ cu. ft. of dry material, there should be six tip boxes: one 1½-cu. ft. box for cement, two 1½-cu. ft. boxes for sand, and three 2-cu. ft. boxes for stone.

### Cracked Concrete Wall Repaired With Flat Iron


When cracks appeared at the corners of a concrete-block wall, flat-iron clamps of the type shown prevented further damage. Long iron rods, which extended diagonally from opposite corners inside the building, tied the corners together, turnbuckles being used to draw the rods up tightly.

### Concrete Forms Braced Overhead Assure Straight Sidewalks




Instead of bracing the stakes that hold the forms for pouring concrete sidewalks, try the method shown. Use long stakes and tie the tops with cleats as indicated. This will assure straight, square walks with no chance for the weight of the concrete to force any portion of the form out of line.

### Vertical Tiles in Barn Foundation Avoid Dampness in Basement


Asked the cause of dampness in a barn basement, one contractor explained that the trouble was due to the fact that the underground tile of the foundation had been laid horizontally. If the lower tiles were placed vertically, moisture accumulating within them would have drained off quickly into the ground instead of seeping through the walls.

### Pebble Finish on Concrete Wall Improves Its Appearance


When making a concrete wall, one home owner produced a neat appearance on the outside of the wall by covering it with coarse gravel of uniform size without mixing it in with the cement. To do this forms were built in sections, covered with hot hide glue and sprinkled with screened gravel before setting them up. After the concrete was poured, moisture softened the glue and the forms were removed easily, leaving the gravel spread neatly over the surface of the wall. When the cement has set, any excess glue that clings to it can be washed off with a garden hose.

### Pencil Eraser and Prick Punch Make Plumb Bob


An emergency plumb bob that will give practical and dependable service may be made from a slip-on pencil eraser and a prick punch. A stout line is knotted and threaded through the eraser, which is then fitted over the end of the punch.

### Pedestal Bird Bath of Concrete Resembles a Tree Trunk

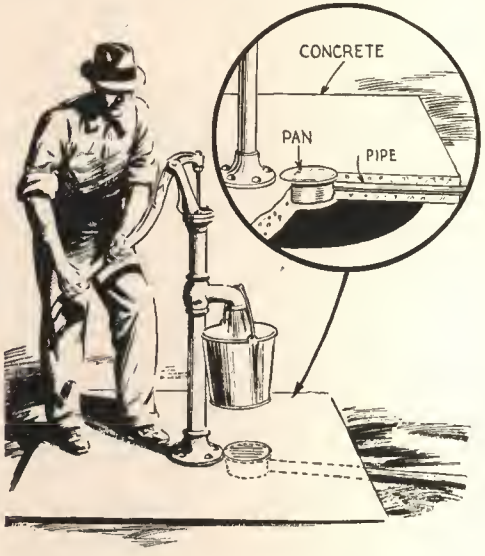
The home owner who wants to try his hand at making novel articles of concrete will find this bird bath a useful as well as a decorative article. Simulating a hollowed ring cut from a tree trunk and nested between four stub branches, the bath is a single concrete unit formed by applying cement to a framework of metal lath. The serrated lines imitating bark were scratched in the surface of the concrete before it hardened. The water receptacle was formed over a sheet-metal disk with metal lath bound around the edges, the disk being set on top of the main framework so that the entire assembly was formed into a single unit as the cement was applied. The bath was built on a concrete platform large enough to keep it from tipping.

### Spiral Iron Stakes to Hold Concrete Forms


In setting up his concrete forms on the ground, one contractor uses twisted iron stakes, which he claims are easier to drive and will hold better than straight ones. They are made from heavy flat iron which is heated, clamped in a vise and twisted, about three turns being made in each running foot of metal. When taking up the forms, the stakes are removed by merely screwing them out of the ground with a long-handled wrench.

### Non-Splash Well Curb Drains Waste Water From Pump

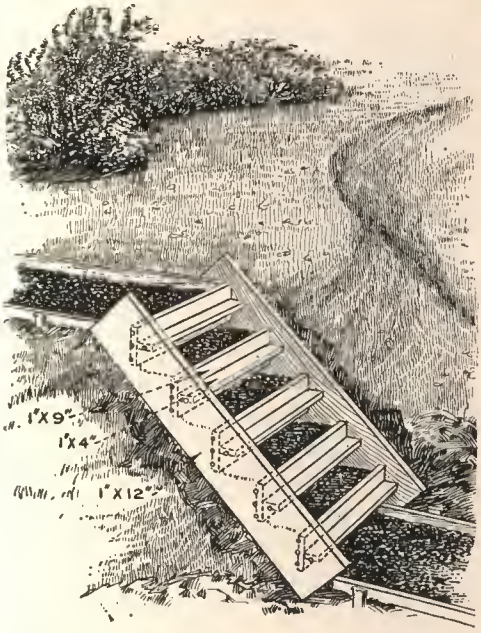
The unsanitary feature of having a bucket under the pump to catch waste water is eliminated with this splashless well curb. When laying the curb a pan is sunk in the soft concrete directly under pump spout until its top is flush with top of the water curb, forming a depression into which water falls. A pipe placed below the surface



of the concrete serves as drain. After the concrete has set sufficiently, the pan is removed and strips of metal are placed on edge in the concrete flush with the top of the opening to prevent water from splashing.—Stanley Russell, Vincennes, Ind.

### Time-Saving Forms for Concrete Steps

When making forms for concrete steps, it takes much time to notch the stringers and nail on the tread strips. This work can be eliminated by using the type of form shown in the illustration. As is evident, no diagonal cutting of lumber is necessary. The sides consist of 1 by 12-in.




stringers, and 1 by 9-in. material is used for the risers. These pieces are cut to equal lengths so that they require only spacing and nailing. Lengths of 1 by 4-in. stock are used to brace the risers. After the concrete has been poured and troweled, a piece of roofing or sheathing paper is tacked over the whole incline. This will carry off rain and prevent the steps from being used until the concrete is sufficiently hard.

### Driving Nails in Cement

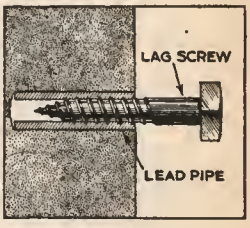
Cement would be used in many places, were it not for the difficulty of driving nails into it so that they will hold. If clean cinders are mixed with the sand and cement, the surface made with this material will hold a nail almost as solidly as if driven in wood.

### Gravel Mixed With Fine Sand Aids in Sifting It


If sand for small construction jobs is too damp to sift rapidly through a screen, toss a couple of shovels of coarse gravel in with it. The gravel will break up the sand lumps and aid in driving it through the mesh of the screen. The gravel does not go through the screen and is used over and over.

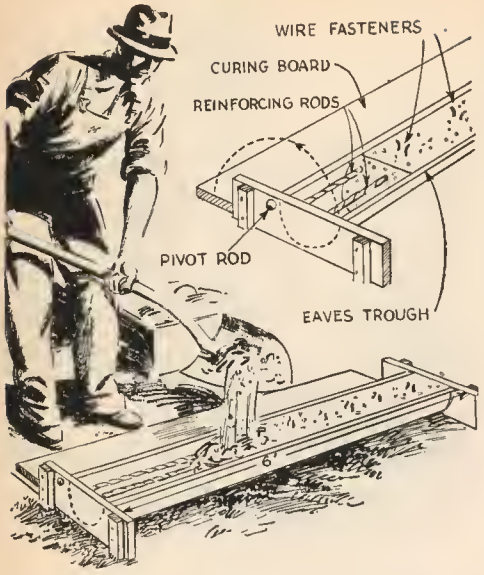
### Securing Lag Screws in Cement or Brick

The practice of securing lag screws in brick or concrete work by means of a wooden plug driven into a hole drilled in the wall is usually unsatisfactory, owing to the tendency of the wood to shrink and drop out. A more satisfactory method is to drill the hole in the usual manner, and then drive in a section of lead pipe having an internal diameter smaller than the lag screw used. When the lag screw is screwed into such a lead-bushed hole, the lead is expanded against the uneven surface of the brick or concrete, and grips firmly, making a permanent fastening.



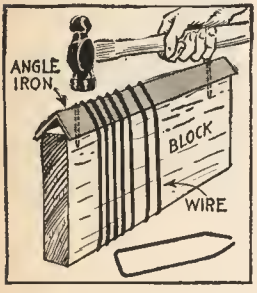

¶Moisture is necessary for the proper hardening of concrete. Wall sections should be covered with moist canvas or burlap.

### Concrete Fence Posts Molded in Eave Troughs




To avoid the expense of building wooden forms or molds with which to make concrete fence posts, a Wisconsin farmer used 6-ft. lengths of 4-in. eave troughs. These were pivoted on rods inserted through the rolled edges of the troughs and supported between stationary end boards. As the concrete was poured, reinforcing rods and tie wires were inserted. When the posts had cured sufficiently for removal, each trough was swung over to inverted position to drop the "green" post on a curing board.

### Tie Wires Cut in Equal Lengths With This Simple Jig




To cut tie wires for concrete forms quickly, a contractor made this jig. Lengths of the wires are varied as required by using blocks of different widths. Besides cutting the wires, it also shapes them.

### Haystack Platform

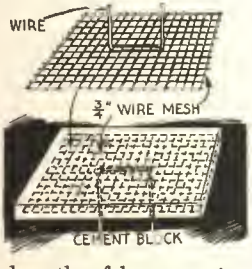
Most farms have at least one haystack outdoors the year round, and much of the hay is spoiled because the layer next to the ground collects moisture and becomes soiled and moldy. By providing a circular base, or foundation, of concrete that slopes away from the center, most of this waste could be avoided. The base should be about 3 in. thick at the edges, and from 6 to 10 in. at the center, according to the diameter. A good underfilling of crushed stone, or cinders, should be provided before the concrete is placed.

### Twist Tamper Does Not Stick in Concrete

The tendency of wet clay or concrete to adhere to the bottom of a tamper can be avoided by giving it a slight twist as it is lifted each time. The twisting action tends

to clean the surface of the tamper and break the vacuum that exists between it and the wet material. To facilitate twisting the tamper, a hand grip is provided.

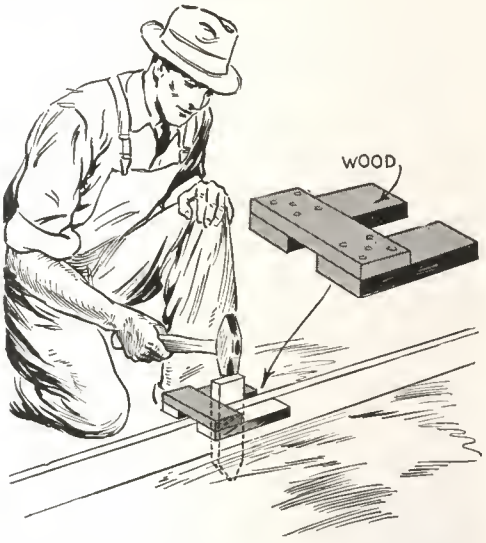
### Reinforce Your Stepping Stones When You Cast Them




If you are going to make stepping stones out of concrete, reinforce them with heavy wire mesh and they can be made lighter and at a saving in materials. When you lay in the mesh, bend a length of heavy wire to a U-shape and insert it so that it will project 3 or 4 in. from the underside of the

stone after the latter has been poured. Then when the stones are placed on the lawn, the projecting wires will be pushed into the ground to help keep the stones from being moved about easily.

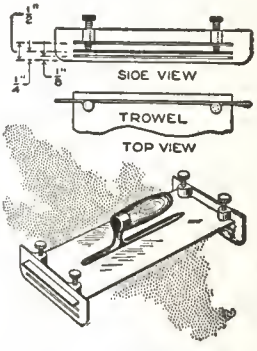
### Concrete-Form Stakes Driven With Aid of Jig



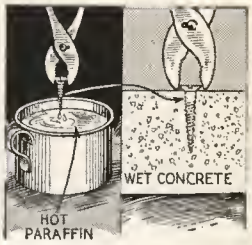

To aid in driving anchor stakes vertically, and firmly against the form boards for concrete walks, one contractor employs this simple jig. It consists of three wood blocks nailed together as indicated.

### Gauge for Plastering Trowel

Plaster, stucco, cement, and similar finishes applied in layers of uniform thickness, can be applied quickly and easily with a trowel fitted with gauges like the homemade ones shown in the sketch. They are of 1/16-in. sheet iron, and provided with slots to fit the ends of the trowel, so as to make the layer of plaster 1/8, 1/4, or 1/2 in. thick, as desired. The gauges are fastened with knurled screws. After the roughing application is made, the surface of the plaster must be smoothed with a plain trowel to remove the tracks of the gauges.



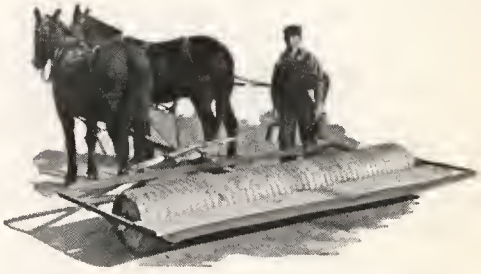

### Setting Screws in Wet Concrete




Sometimes it is desirable to set a screw in concrete so that it can be driven or removed. This can be done if the screw is set while the concrete is wet. First dip it in melted paraffin and then put it in place. The paraffin coating will prevent the concrete from adhering to the screw, which can be turned out after the concrete has hardened, leaving a permanently threaded hole. It is best to use a brass screw to avoid rusting and sticking.

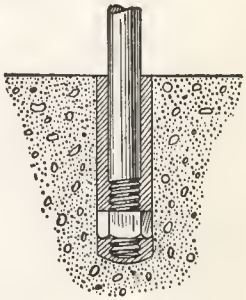
### Culvert Filled With Concrete Provides Land Roller

Finding himself unable to obtain a land roller, a farmer made one from a 12-ft. length of regular corrugated steel culvert. A long shaft to serve as an axle was centered in the culvert, after which it was



filled with concrete. A wood framework fitted with bearings to take the ends of the projecting shaft provided a handy hitch for the roller.

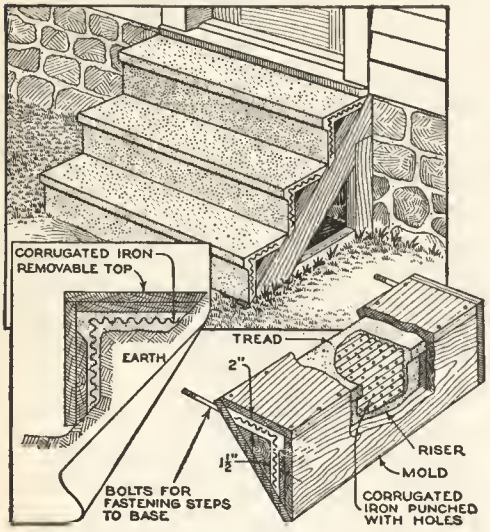
### Floor Bolts for Machinery



Make a hole in the concrete large enough to receive the nut of the bolt to be used. Place the bolt with the nut down in the hole and fill the space with melted babbitt. By using this method a temporarily located machine may be taken away, as the bolts are easily removed, and the holes plugged, leaving no projections.

### How to Reinforce Concrete Steps

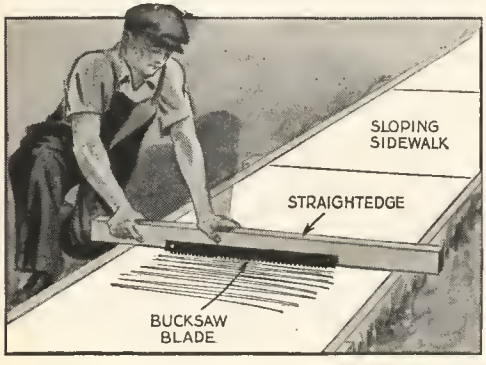
The type of concrete shown in the drawing can be molded individually and attached to wooden stringers with bolts to




make a light but durable flight of steps. Each step is reinforced with corrugated sheet iron, which is liberally punched with holes and bent at right angles. The L-shaped wooden form is stood on one end, and the concrete poured into the opposite end. Bolts of the proper diameter and length are inserted into the form so that the completed step can be attached to the stringers. The same form can be applied to the molding of steps in a solid unit, only in this case the concrete is poured from the top of the form, which should be made removable. By either method a considerable saving in concrete work is effected.

### Bucksaw Blade on Straightedge Rough-Finishes Sloping Walk

When making a sloping sidewalk that should have a rough finish so that it will not be slick when wet or frosty, an old bucksaw blade nailed to a straightedge will enable you to roughen the concrete easily before it sets. The blade is moved back and forth while sliding the straightedge over the fresh concrete, leaving a rough but neat design of grooves in the surface. Depth of the grooves is determined by the projection of the saw below the straightedge.




### Mortar Box on Wheels Is Moved Wherever Desired

A Nebraska farmer uses this portable mortar box, not only for transporting batches of concrete and plaster about the farm, but also for moving liquid feeds. The mortar box is carried on an iron frame fitted with three wheels. The front end as-

sembly comprises a swivel from an old side delivery rake and a wheel from a plow. The frame is welded together, the rear end of the cart being supported on two small cultivator wheels, which rotate on a pipe axle. A handle to pull the cart is attached to the frame directly over the front wheel. As the box is easy to remove from the cart the latter can be used for other purposes.

### Covering Fresh Cement in Winter

If you have just put in a cement sidewalk and it is necessary to cover it to avoid freezing, be sure to use building paper rather than waterproof paper. Moisture condenses and collects under waterproof paper and may freeze fast to the work, but building paper absorbs moisture.

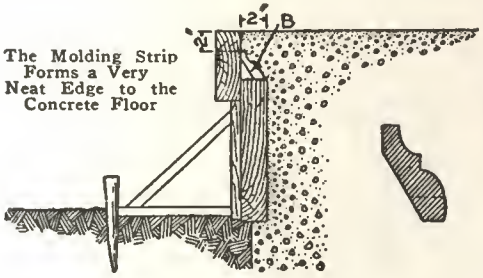
### Preparing Concrete for Painting

To neutralize lime salts in new or untreated concrete floors, apply a solution of zinc sulphate, 3 lbs., per gallon of water. If the floor has a hardened surface so paint cannot anchor, apply an etching solution of muriatic acid, 1 part and water, 10 parts

(by volume). This is put on after the neutralizing application. After allowing the acid to act for a couple of hours, wash the concrete thoroughly in order to remove all traces of acid. When dry, apply thin paint. It is better to put on two thin coats than one heavy coat. Use special concrete paint.

### Molding an Edge on Concrete Porch Floor

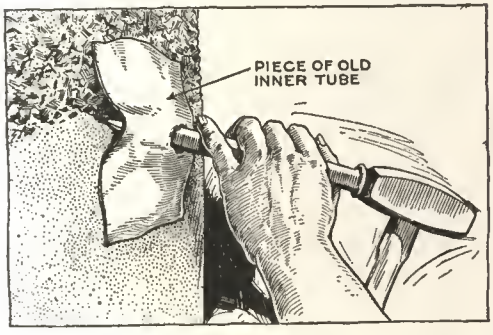
The facing boards of the mold are built up as high as the porch is to be made, allowing an offset of 2 in., or the thickness




of the first plank, as shown. The square corner formed by the offset in the boards is filled in with a portion of a crown mold. The molding piece is prepared by ripping the piece on the line shown in the cross section A. The strip is then fitted in the offset, as shown at B. First a neat cement is filled in against the form, then the coarser mixture placed on the inside.

### Rubber Shield Protects Worker From Flying Chips

Flying chips, produced by a star drill or cold chisel on stone or cement, can be prevented from injuring the worker by using




a rubber shield. Take a piece of rubber from an old inner tube and cut a small hole in the center so that it can be slipped over the tool. Keep it near the point as indicated, and you will not be troubled by chips as they are all stopped by this shield.

### Rubber Shield on Shovel Handle Deflects Water


When using a shovel where water and mud are likely to run down the handle, try a rubber shield similar to the one shown. It is a disk cut from an old inner tube with a hole made in the center to slip tightly over the shovel handle. Cut this hole small so it has to be stretched to go over the handle, and the disk will take a cup shape.

### Easy Way to Heat Mortar Water When Weather Is Cold

Here is the way water from a hydrant was heated for mixing plaster mortar during many cold months last winter. Two sections of hose were used with an 8-ft.


length of steel conduit or pipe between them. This was supported on stones at each end and a fire kept burning around it. By slowing down the flow of water the temperature increased. In fact, it was no trick to obtain water rapidly near the boiling point.

### Dog Kennel in Back-Door Steps

A wooden barrel placed in the concrete back-door steps provides a place for the family dog. Less concrete is required and two jobs are accomplished for the price of one, although a little more reinforcing of the steps will be necessary. If you do not have a dog, the extra space can be used to store rubbers, garden tools, etc.

### Stock Salt on Concrete Tile Is Kept Off Ground


Instead of putting his stock salt on the ground or in a box where it is likely to be wasted, one farmer sets it in the bell end of a concrete tile. This is set in the ground to prevent tipping. If loose salt is used, the tile can be partly filled with concrete and a drain provided to carry off rain water.

### How to Make a Cement Coping on Brick Walls

In the sketch Fig. 1 shows how to construct a form to make a cement coping on brick walls. Use two 6-in. boards, AA, and nail on a 1 by 2-in. strip, BB, on the bottom of each to form the projection of the stone. The strips may be of any width to suit the thickness of the coping desired, but 4 in. thick is about right for 8 and 12-in. brick walls. Under the side boards put strips, CC, perpendicular to the ground, to hold the form at the proper height. Brace the form as shown to keep it from spreading when the cement is put in. Short forms will not need bracing, but any form 6 or 8 ft. long should have at least one brace on each side. A board, D, notched just right to fit over the top of the mold, will do for a brace in some places. After the mold is put in place take some thick cement mortar and stop all cracks where the mold does not fit the bricks. This should be well done so the water will not drip through and deface the brick work. As soon as the mold is ready, mix the sand and cement in proportions of 1 part cement and 2 or 3 parts of sand. Mixing 1 part cement and 3 parts sand will make a good job, but 1 part cement and 2 parts sand will be better. Mix the cement and sand dry before putting any water with it. Put the cement into the mold and with a trowel work it down well along the sides filling the mold completely, and rather quickly. After the mold is full, level the cement off on top and trowel to an even surface. After the cement has set sufficiently to stand without running, then, with a trowel, clip the top corners and smooth them down.

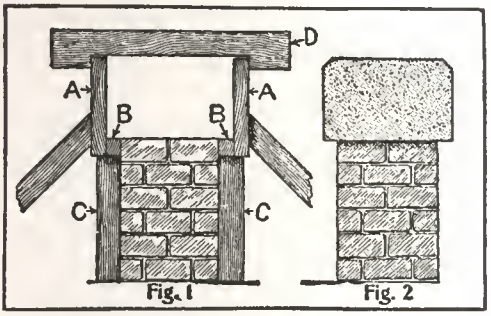
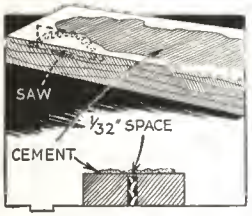



**Fig. 1 shows how the form is built; Fig. 2 shows the coping in place**

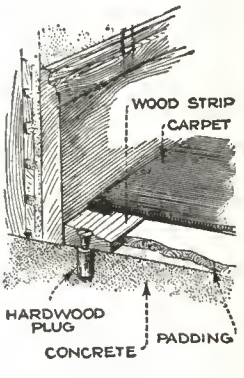
### How to Save Wear on Saw Blade When Ripping Concrete Forms



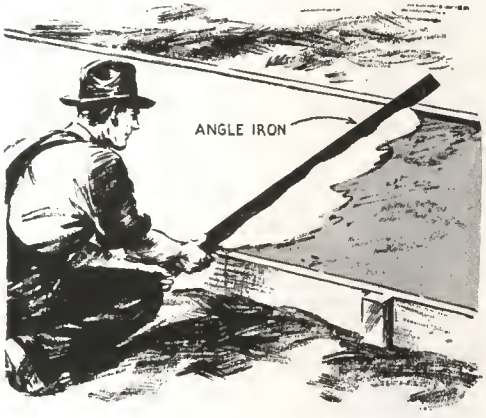

Next time you rip boards that were used for concrete forms, you can save a lot of wear on the saw by setting the blade so that it lacks about 1/32 in. of cutting through the work. In this way, the teeth of the saw blade do not come in contact with the cement, which eliminates frequent sharpening. The thin sliver left on the edge of the boards can be scraped or planed off.

### Attaching Carpet to Concrete Floor

Attaching a carpet to a concrete floor is rather difficult because nails or tacks cannot be driven into the concrete. It can easily be done in the following way, which, however, requires the use of padding under the carpet: Drill holes in the concrete along the edge of the wall about 1 foot apart, and plug these with hardwood. A tapered wooden strip of approximately the same thickness as the padding is run along the edge of the room, being fastened to the wooden plugs with screws. The padding is then laid on the floor, inside the tapered strip, and the carpet stretched over it and tacked to the strip.




### Angle Iron Is Good Straightedge to Finish Concrete Walks




Used as a straightedge, a length of angle iron is much better than a board for smoothing and finishing concrete walks and floors. The weight of the iron helps to hold it firmly on the form edges, ready for movement in either direction.

¶Greasy concrete can be cleaned by scattering trisodium phosphate thickly on the spots and then sprinkling with just enough water to dissolve it. After waiting an hour or more, scrubbing with water will remove the spots.

### Large Stones Are Broken Safely by Heating and Rapid Cooling

Desiring to break up and remove a large rock on his property without the use of dynamite, one home owner did the job by heating the rock and then dashing water over it. A trench was dug around the rock, and brush and wood were burned in it for a few hours to heat the rock. After the rock was heated thoroughly, cold water was suddenly thrown on it, which caused it to crack into several pieces.


### Oil-Soaked Bricks Make Fuel for Heating Sand

Instead of using coal or wood to heat sand and other materials on a construction job during cold weather, one foreman substituted oil-soaked bricks. These burn steadily for some time, require no poking or other attention to keep them burning, and there are no ashes to accumulate and clog the draft. A number of the bricks may be kept in a pail of oil drained from auto crankcases.


¶Sometimes it is better to cover old masonry with reinforcing for stucco than to get a bond by roughening the surface.

### Concrete Forms Lined With Paper Make Finished Work Smooth

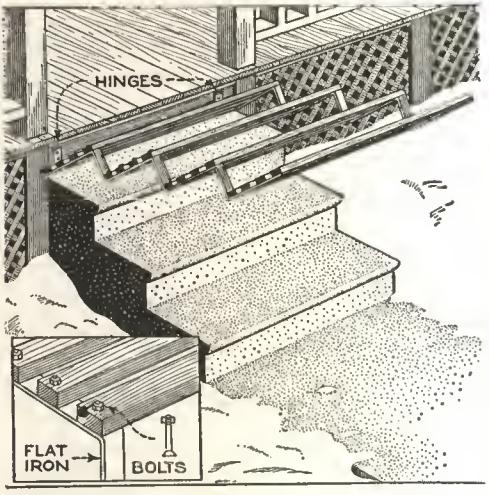

When using old lumber as concrete forms you can give the finished work a smooth surface by lining the forms with roofing paper. This will make it unnecessary to chip off high spots or plaster indentations in the concrete work to provide a smooth surface. The paper is easily removed from the concrete after the forms have been taken down.

### Hose Held on Side of Mortar Box While Mixing Cement

To facilitate adding water to cement while mixing it single-handed, one workman used a short piece of wood having three holes drilled through it to take the hose as indicated. A pair of iron brackets screwed to the side of the mortar box supported the wood vertically and permitted it to be removed quickly when not needed.


### Making Steps Safe in Winter

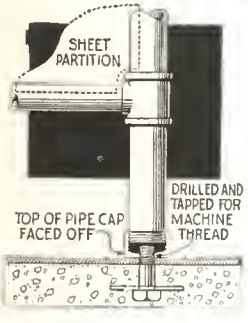
Owing to the accumulation of ice on the surface of cement steps during winter, they not infrequently cause accidents. The danger can be eliminated, to a large extent, by covering the steps with a frame, as shown in the illustration. Two lengths of flat iron are bent to conform to the shape of the steps, and 1 by 1½-in. wooden strips




are bolted across them, as shown. The strips are spaced about ¾ in. apart. Hinges are screwed to the riser of the upper step on the porch, so that the whole frame can be swung up when it is necessary to clean the steps. The hinges should have loose pins, so that the frame can be detached entirely when the winter is past.

### Pipe Supports for Partitions Anchored to Concrete

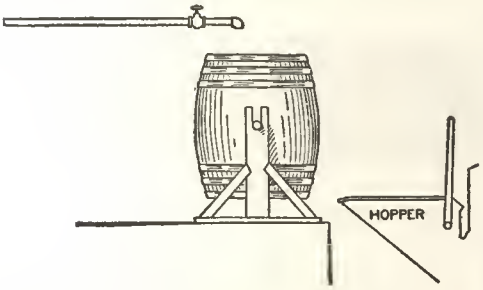
Instead of using three or four bolts and a plate to anchor each standard of a pipe-supported partition to a concrete floor, use a pipe cap and one bolt as shown. You'll find that this method results in a neater



job than if plates are used. It also saves labor as only one hole has to be drilled in the floor for each standard.

### Water Barrel for a Mixer

On a concrete job, a water barrel is usually behind the mixer, and the man in charge of the mixing uses a pail to get the



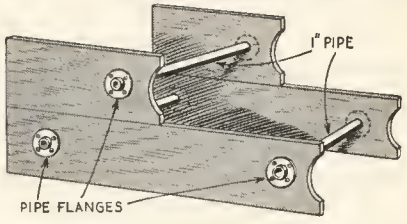

water from the barrel to the mixer. The accompanying sketch shows the arrangement of a barrel mounted on a trunnion and placed to one side of the mixer. This is filled to a certain height, and when the batch is ready for the water, the barrel can be tilted and emptied easily and quickly. This allows a measured and uniform quantity of water to be added to the mixer in the shortest time possible. The trunnions could be mounted on a band and the band bolted at any desired height on the barrel. This would allow the easy dumping of any required quantity of water.

### Spray Gun Fills Foundation Cracks

For forcing cement into cracks in foundations, an ordinary insect sprayer is useful. The receptacle for holding the liquid was removed, and the hole in the end of the tube enlarged. Near the upper part of the tube, a 2-in. slit was cut, and the ends were bent back to provide an opening for loading the gun. Pressure on the pump handle forces the concrete into the cracks, while the smooth tip of the gun puts an even finish on the surface. This method will also be found useful to force plastic compounds into cracks along door frames and window casings.

### Steps Made From Concrete Blocks

Anyone who wants to build concrete steps in front of a door or porch and is not familiar with mixing concrete, can do a good job by using concrete blocks. These can be purchased in any locality at a reasonable price. Steps made in this way are




not likely to be affected by frost in the ground, and if one should crack, the entire assembly will not be damaged as is the case when the steps are poured. Hardwood end pieces, tied together by lengths of pipe run through the hollow centers of the blocks, hold the assembly together.

### Cement Makes Tight Pipe Joints

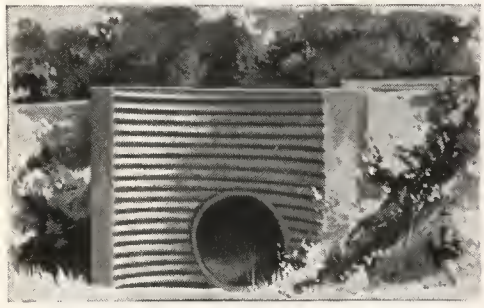
A good cement for sealing pipe joints of all kinds, except those in gasoline or oil lines, is made by mixing portland cement with linseed oil to the consistency of paint. The mixture is sufficiently abrasive to "grind in" a pipe thread and make a tight joint that would otherwise leak. It dries slightly pliable so that the joints come apart easily years later.

### Aggregate Heater on Small Jobs of Concrete Work


Two lengths of stovepipe and an elbow assembled as shown provide a simple heater for sand and stone on small concrete jobs. The heater is set in the aggregate pile in the position indicated and is fired with a piece of cotton waste soaked in fuel oil or old crankcase oil.

### Forms for Concrete Culverts

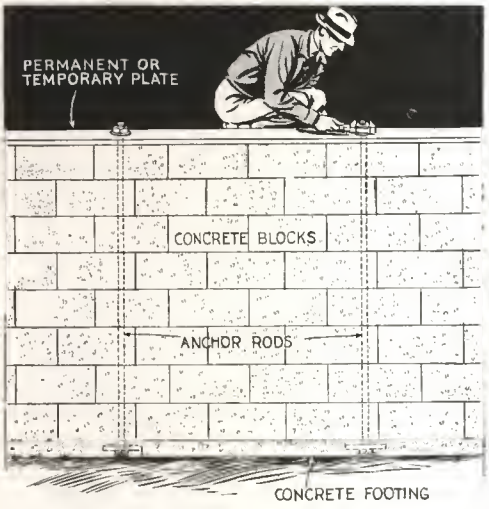
Forms for concrete end walls for small road culverts are easily made from a few sheets of corrugated-iron roofing. The ends of the sheets are nailed to a 2-in. plank wide enough to give the desired thickness to the wall. A hole is cut for the tile and the form is ready to be poured. The corrugations help strengthen the



form so that less bracing is required; at the same time the sheet iron permits bending so as to make a semicircular wall if desired, a feature that would require considerable work if a wooden form were used. The form is light and easily handled, and the wavy surface adds to rather than detracts from the appearance of the finished wall.

### Concrete-Block Walls Reinforced With Long Anchor Rods

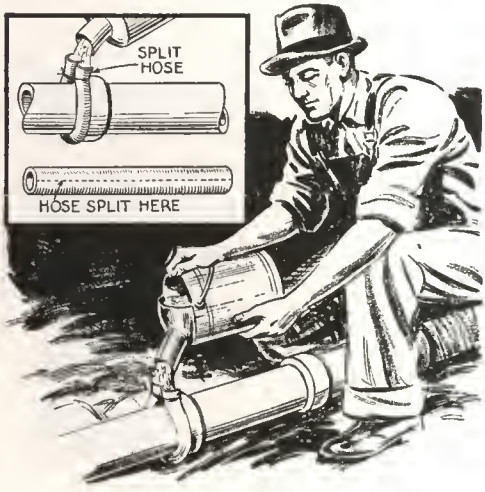
Installed in the footing before a wall of concrete blocks is laid, these reinforcing rods help to keep the wall in alinement.




When the wall has been completed, a plate is laid on top and large nuts are driven onto the threaded ends of the rods.

### Soil-Pipe Joints Are Cemented With Rubber Forms

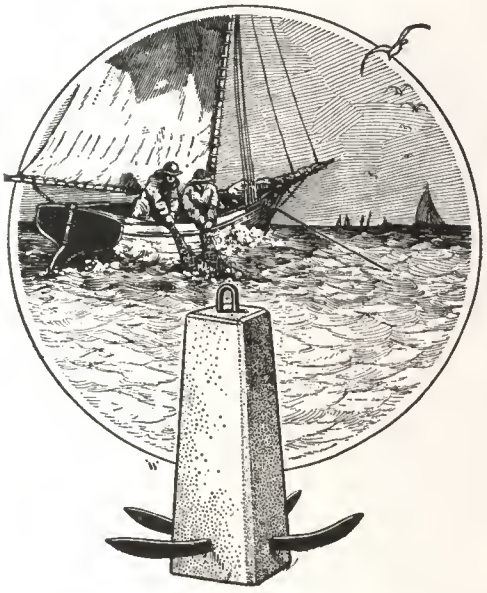
Any inexperienced worker can cement sewer or soil-pipe joints neatly by using rubber-hose forms, which are made by cutting out a strip lengthwise after cutting



it in pieces long enough to reach around the pipe. In use, a piece is drawn up around the pipe with the open side butting against the bell end of the pipe, after which the ends are tied together. Be careful not to fold or tie the hose so tightly that it closes. Next, a thin mixture of cement is poured into the hose, lightly tapping it with a hammer at the same time so that the cement will work well into the joint. When the cement has set, the form is removed, leaving a neatly rounded job.

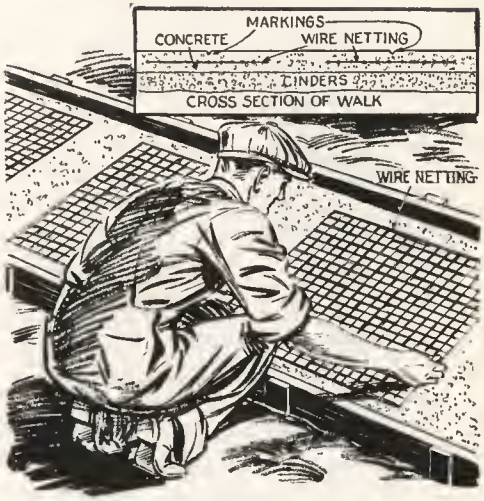
### Anchors Made of Concrete

The boat anchor illustrated is easy to build and has proved very effective for mooring yachts and other pleasure and commercial craft. The concrete block is 18 inches square at the bottom, 12 inches



square at the top and about 5 feet high. To increase the holding power protruding arms of 3-inch T-irons, bent up to form hooks, are imbedded in the concrete. A simple square wooden box form is used for molding the anchors. Fillet strips are used to cut off the corners, the sides being mortised so that the T-irons can project. The top form is similarly mortised to accommodate the lifting hook, which is a length of ½-inch round steel bar, bent to a U-shape and extending into the concrete about 10 or 12 inches. The anchors cost very little to make.

### Sidewalks Reinforced With Wire




When laying a new sidewalk, it's a good idea to imbed strips of wire mesh in the concrete under the expansion joints, which reinforces the concrete and helps it withstand "heaving" action of the ground underneath when it freezes. If frost causes the walk to crack through at the joints, the wire mesh helps keep a block or section from raising above the surface of the abutting one.

### When Breaking Concrete

An old broom will come in handy when breaking up concrete. Use it as shown in the drawing to hold the bull point or chisel, and to prevent bits of concrete from flying up. When using a compressed-air hammer, or power concrete breaker, slip a piece of screen, about 1 foot square, over the point of the drill. This will enable the

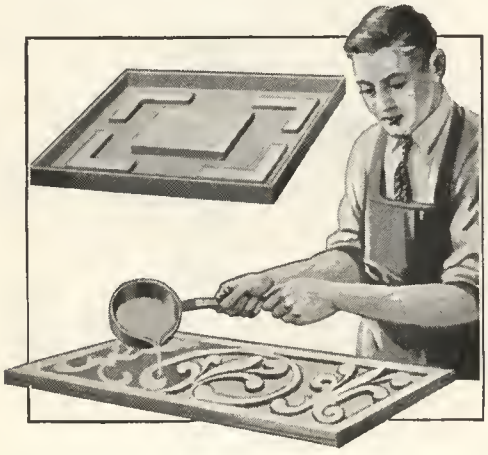
operator to see the work through the screen without danger from the flying bits of concrete.

### Mortar Box From Old Oil Drum

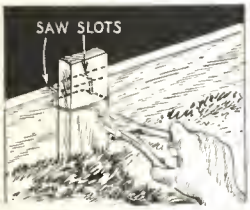

Here is a mortar box that is not only more substantial than the usual type, but one that is more convenient as it has two compartments, the sloping sides of which make it easy to scrape the mortar from one into the other. It will also stand much abuse, and accumulations of dried mortar may be pounded from its sides easily.

### Buhlwork With Colored Concrete

Buhlwork is easily made with colored concrete. A wood pattern is cut out on a scrollsaw and is tacked to a back to form a mold, after which the concrete is poured into the cut-out part of the pattern. Another method is to arrange pieces of heavy cardboard in a mold and fill it with concrete. After the concrete has set for a day or two, the cardboard is removed and the resulting depressions are filled with colored concrete. If desired, the patterns may be made of colored woods or polished brass and left in the work. A third method of imitating buhlwork is to stamp the pattern. In this case, the concrete is poured into the mold, and the patterns are pressed into the soft concrete.

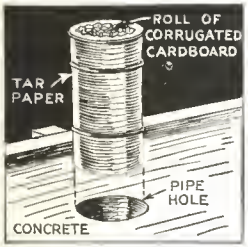


### Slots in Concrete-Form Boards Hold Tie Wires




When building concrete walks, one workman claims that much time can be saved by sawing slots in the form boards to receive the tie wires instead of boring holes for them. The wires are merely bent, dropped into the slots of the form boards, and twisted around the supporting stakes.

### Roll of Cardboard in Concrete Provides Hole for Pipe




Instead of wasting time whittling wooden plugs to certain lengths and sizes to make pipe holes in fresh concrete, roll strips of corrugated cardboard to the required diameter. A layer of tar paper is then added to prevent water in the concrete from softening the cardboard after which the roll is tied with string or held by slipping a couple of rubber bands over the ends.

### Solutions to Clean Concrete

Rust stains can generally be removed from concrete by using the following solution: Dissolve sodium citrate, 1 part, in water, 6 parts and add commercial glycerin, 6 parts. Mix this (a portion) with enough powdered whiting or chalk to form a paste, and spread it in a thick coat. When

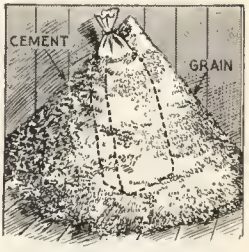
dry, replace with fresh paste or moisten with the remaining liquid. A week or more may be required to remove the stains. To remove fresh oil stains cover them with an inch or two of dry portland cement. For old stains wash with a solution of trisodium phosphate, 2 lbs. to the gallon of hot water. After cleaning remove all traces of the solution by rinsing with clear water.

### Hog Trough Serves as Form for Concrete Corner Posts

Confronted with the need of some substantial corner posts for his field fences,


which could not be purchased in town, one farmer employed a hog trough as a form for making the posts from concrete. If the trough available is too long, a triangular piece can be toenailed in it at the correct location without damaging the trough for its regular use.

### Sacks of Cement Are Kept Dry in Grain Bin

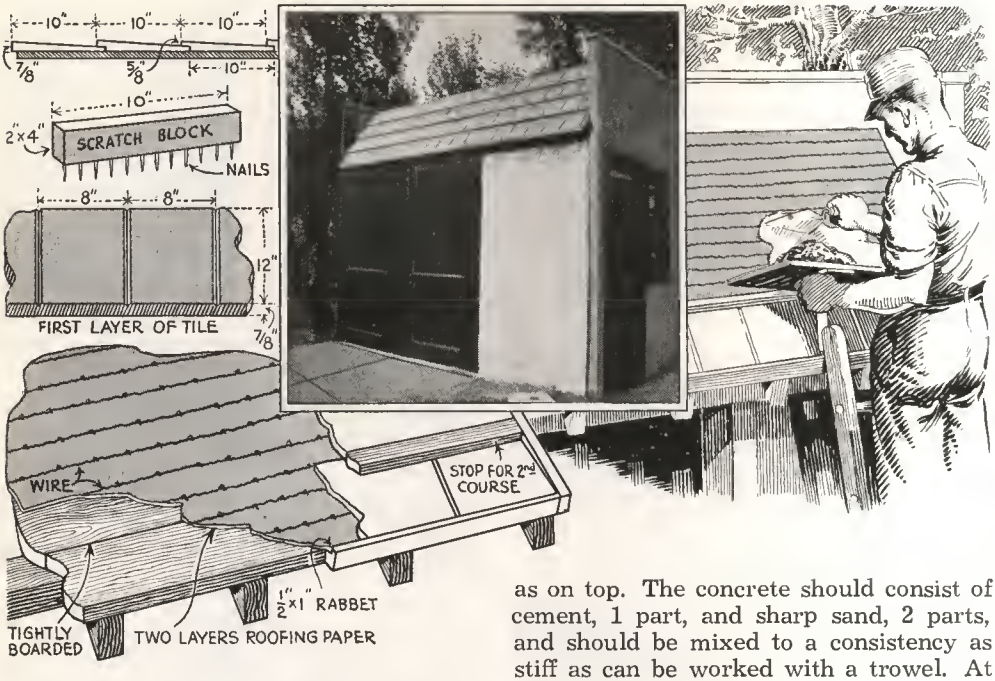



To keep a partly empty sack of cement dry and free of moisture, one farmer merely places the sack in the corner of his granary and shovels loose grain around it. The dry grain will take up moisture on humid days and prevent it from damaging the cement.

### Heating Water for Sub-Zero Concrete Work

To mix cement with the temperature below zero, two barrels were set about 6 ft. apart, one elevated about 3 ft. above the other, and then three coils were bent in a 16-ft. piece of ¾-in. pipe, one end being put in each barrel. This left the pipe on a slant between the barrels. A fire was built under the coil and cold water was poured into the elevated barrel. As the water ran through the coil it was heated and passed into the lower barrel hot and ready for use. Two other methods may be used as shown in the sketch. The first one shown is two barrels on the same level, connected with a pipe and having a coil in the center attached to the bottoms of the barrels. A straight pipe is put in about one-third the way down from the top of the barrels. Water can be put in both barrels to a level just above the top pipe and the circulation will be free enough to heat the water quickly. The other method is to attach a pipe coil to one barrel as shown. This will cause a circulation free enough to heat the water rapidly.

# Spanish Flat-Tile Roof Imitated With Cement




You'll be surprised how easy it is to imitate Spanish flat tile with cement on a short roof such as the garage shown in the photo. Of course, the job can be done on larger roofs, but they must be rigidly reinforced to support the weight, as any tendency to sag will crack the concrete. The roof to be tiled must be boarded tightly and covered with a double layer of heavy tar paper. On this, staple pieces of No. 9 iron wire about 3 in. apart and kink it so that cement can get under it as well as on top. The concrete should consist of cement, 1 part, and sharp sand, 2 parts, and should be mixed to a consistency as stiff as can be worked with a trowel. At the eaves, start your first slab, making it 12 in. wide and 1 in. thick at the lower edge, tapered to ½ in. at the top. After the concrete has set about 45 min., score the surface at 8-in. intervals to simulate the tile, sinking the score lines a distance equal to about one third the thickness of the concrete. Then, using a scratch block like the one shown, scratch the surface about ¼ in. deep. Now nail a 1 by 4-in. wood strip 10 in. above the lower edge of the first slab and start the next one.

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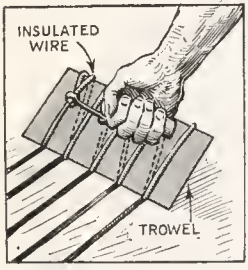
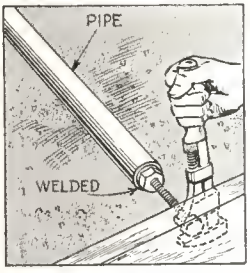
### Trowel Wrapped With Wire Is Scoring Tool for Concrete



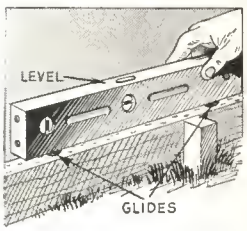

Where the slope of a new concrete walk is such that it must be scored to provide a footing when the surface is slippery, and no special scoring tool is at hand, you can use your regular trowel for the purpose. Just wrap it with insulated wire or heavy cord as indicated and pull it across the surface of the concrete before it hardens.

### Adjustable Brace Has Many Uses




Lengths of pipe with nuts welded over the ends and bolts threaded into them make handy braces for the interior of concrete forms, braces for mine timbers and similar uses. The braces are adjusted by running the bolts in or out of the nuts, and if stud bolts are used, two lengths of pipe can be connected by screwing two nuts onto one bolt.

### Level Fitted With Feet to Use It Accurately on Rough Surfaces



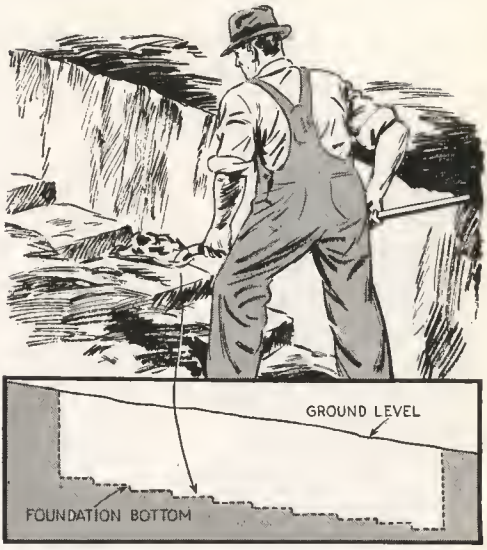

For leveling concrete forms and other work where the surfaces on which the level must rest are likely to be rough, one contractor fitted the level with a couple of furniture glides, which served as feet. With this arrangement it was only necessary to clean a place on the work on which to rest the feet.

### Paint for Interior Basement Walls Made From Cement and Milk


If you would like to clean up your basement walls and give them an inexpensive white coating, try a mixture of white cement and skim milk. In mixing, pour the cement into the milk, stirring it constantly until the mixture has reached a consistency that can be applied to the walls with a brush. Proportions are not critical. A paint of this type will adhere and will withstand vigorous scrubbings and abrasions.

¶Holes in concrete are ordinarily caused by air bubbles. These may be eliminated by stirring, after the concrete has been placed in the forms, with long iron rods.

### Bottom of Sloping Foundation Stepped to Avoid Cracks




When laying a concrete or masonry foundation on sloping ground for a building, slope the trench so that the low side of the wall is in the ground the same depth as the high side. And, instead of gently sloping the bottom of the trench, step it as indicated. When done in this way and the corners reinforced, there is little possibility of cracking or sagging.

### Shovel Is Conveyance for Cement


Being at a loss for some means of transporting cement and rock from the curb to the job, as there was no wheelbarrow to be found in the neighborhood, one home owner used as a substitute, a shovel as shown. The work was done in short order without damage to the lawn or walks.

### Comb of Safety Razor on Level Scrapes Top of Form


In checking concrete forms with a level, one workman employs a safety-razor comb on the end of his level to scrape off dried concrete from the form board to assure accuracy of the reading. The scraper is always at hand when it is needed, and does not interfere in any way with the regular use of the level.

### Rubber Shield on Hand Sledge Catches Flying Particles


The risk of flying particles hitting your eye or face, when breaking stone or concrete, can be minimized by using this sledge shield. Cut from a piece of inner tube, the shield is slipped over the handle first and then over the head of the sledge.

### Air Chamber Prevents Tank From Bursting

Cracking, and possible ruin of concrete watering trough by freezing, was prevented on a ranch by anchoring an empty 5-gal. can to the bottom of the tank. The can was made air-tight by screwing the cap down tightly against a rubber gasket, and was then anchored to the bottom by a rock. As the can was kept well below the surface of the water, the pressure of freezing water against the sides of the tank was in a large measure prevented by the collapse of the sides of the can.

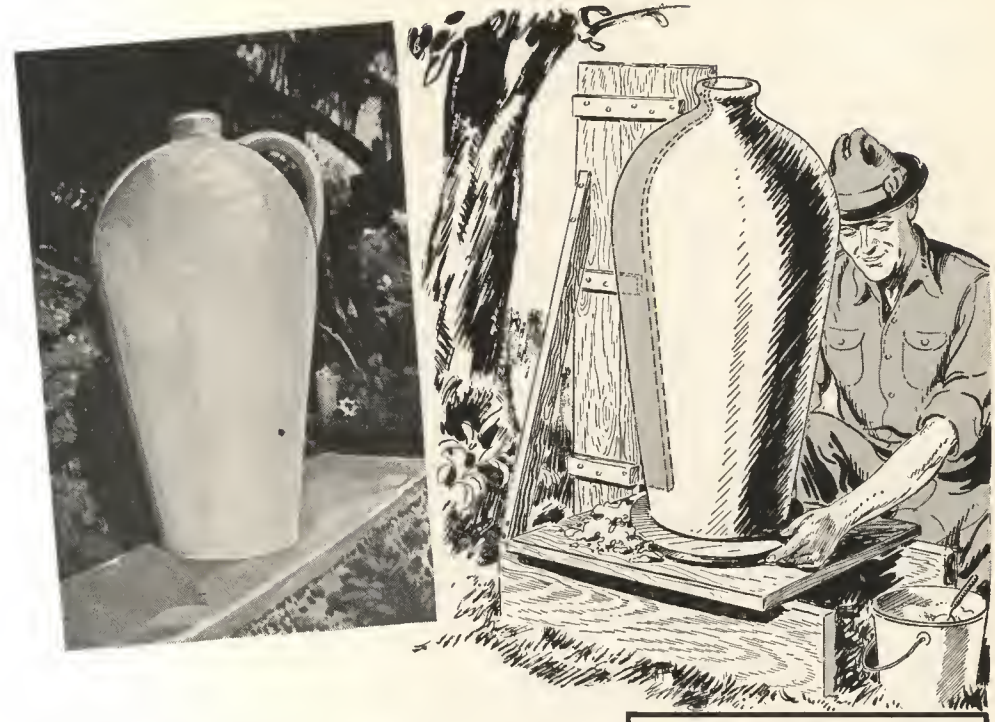
### Movable Form Aids Contractor


Contractors who fill in between floor joists with concrete will find this movable form helpful. If care is taken so that the concrete mixture is not too wet, and sufficient tamping is done, the form can be removed immediately after pouring the concrete and can be used again.

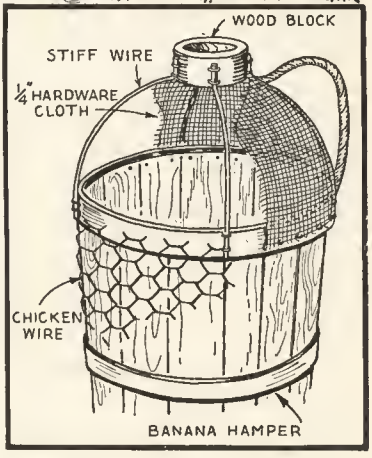
### Small Drains in Concrete

Where it is necessary to make drainage grooves in concrete before it has become hardened, a neat groove of uniform size and shape may be provided by using a length of iron pipe of the proper diameter as a form. The pipe is partly imbedded, and removed carefully. If it is necessary to refinish the groove, a short section of pipe, smoothed to a polish and rounded up at the ends, makes a good improvised surfacer.

# Large Cement Jugs to Decorate Garden Nooks



Garden jugs and vases are made with little effort by using a wire-mesh-covered form that need not be removed. The top reinforcing is held together by a wooden block which is removed after the top has been cemented. As such a jug is purely ornamental, the mouth can be cemented shut so that water will not enter, which may freeze and crack the jug. The cement mixture consists of torpedo sand, 3 parts, cement, 1 part, and hydrated lime, 1/10 part. Add just enough water to get a "fatty" consistency. After standing an hour, the cement is troweled on while rotating the jug on a small turntable to scrape the cement against a form to get uniform contour all around. Color may be added to the cement, which is better than painting it.




**Concrete-Form Oil**

Concrete will not stick to forms that have been oiled each time before use with a mixture of boiled linseed oil and kerosene, in equal parts. If not so oiled, the forms should at least be carefully wetted down before the concrete is poured. Whitewash is frequently used for the same purpose, and makes an acceptable coating. If the whitewash is applied thin it will not stick to the concrete. If the forms are to be used again, they should be taken apart, and all adhering particles of cement carefully cleaned off.

**Protecting the Edges of Concrete Steps**

A band of 3/16 by 2-in. strap iron, bent to shape, bolted, and inserted in the forms, will protect the edges of a concrete watering tank against breakage caused by weathering or by a wagon being driven against it.

# Concrete Handbook Index





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